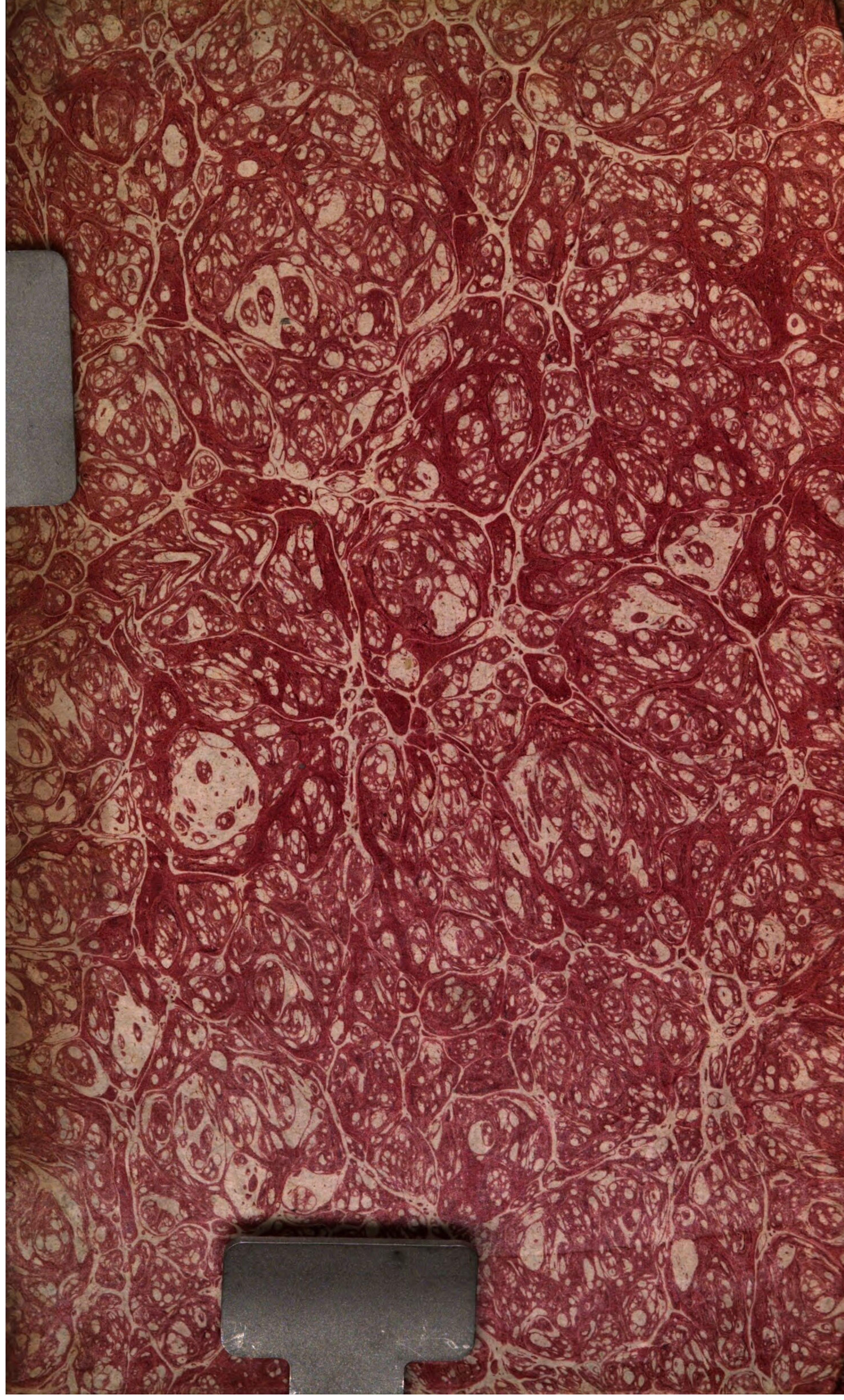
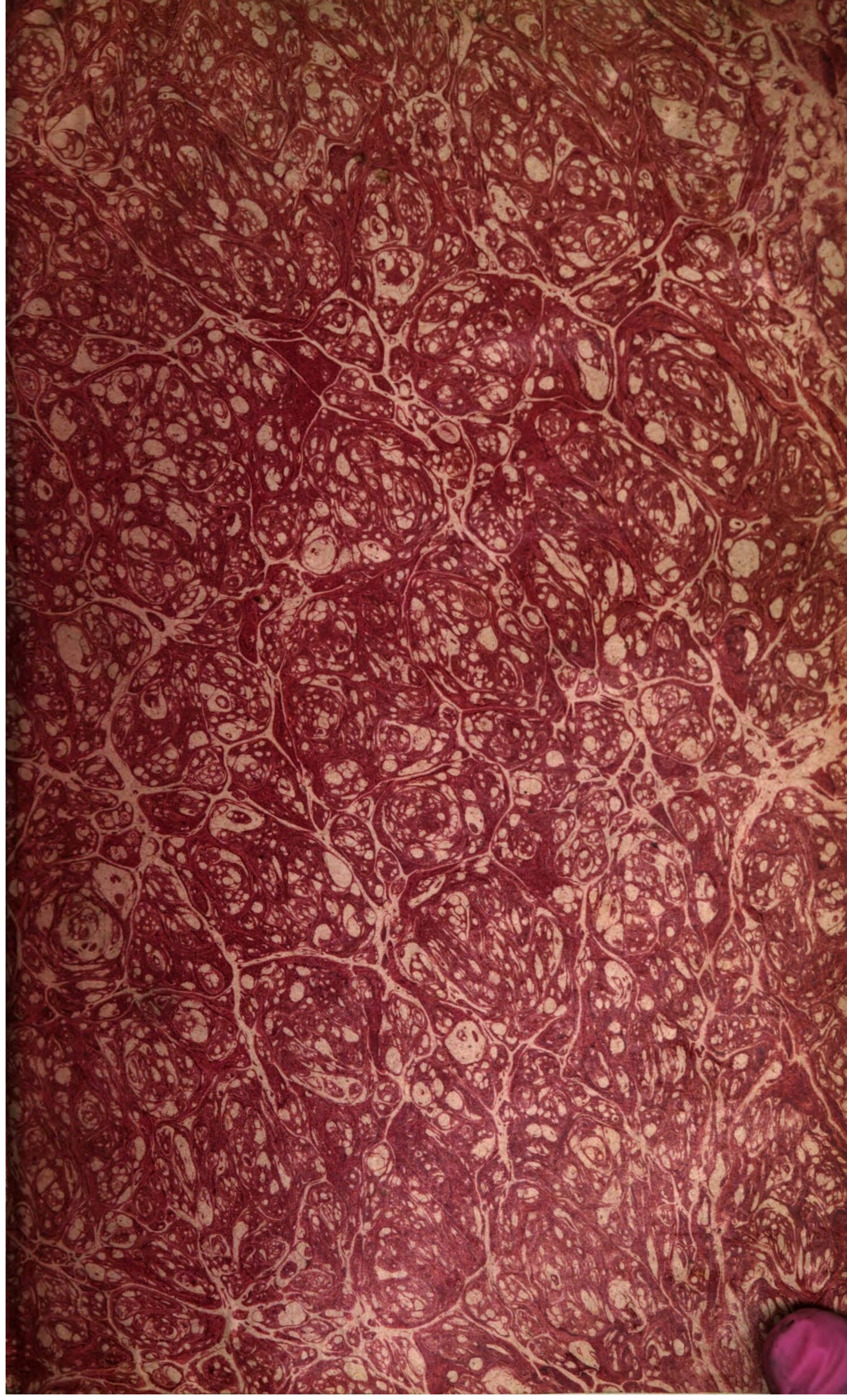








Ph. 1909. a.

Dec. 577

Oeconomia. S. agriculturæ singular. region.
169.

~~Dec. agr. N. 69.~~

R

FOREIGN ESSAYS

O N

AGRICULTURE and ARTS.

CONSISTING CHIEFLY

Of the MOST CURIOUS DISCOVERIES made in
the several PROVINCES of

FRANCE, || FLANDERS,
GERMANY, || SWITZERLAND, &c.

A N D

Communicated by the LEARNED in those COUNTRIES

For the Improvement of

BRITISH HUSBANDRY.

With OBSERVATIONS by the TRANSLATOR.

L O N D O N,

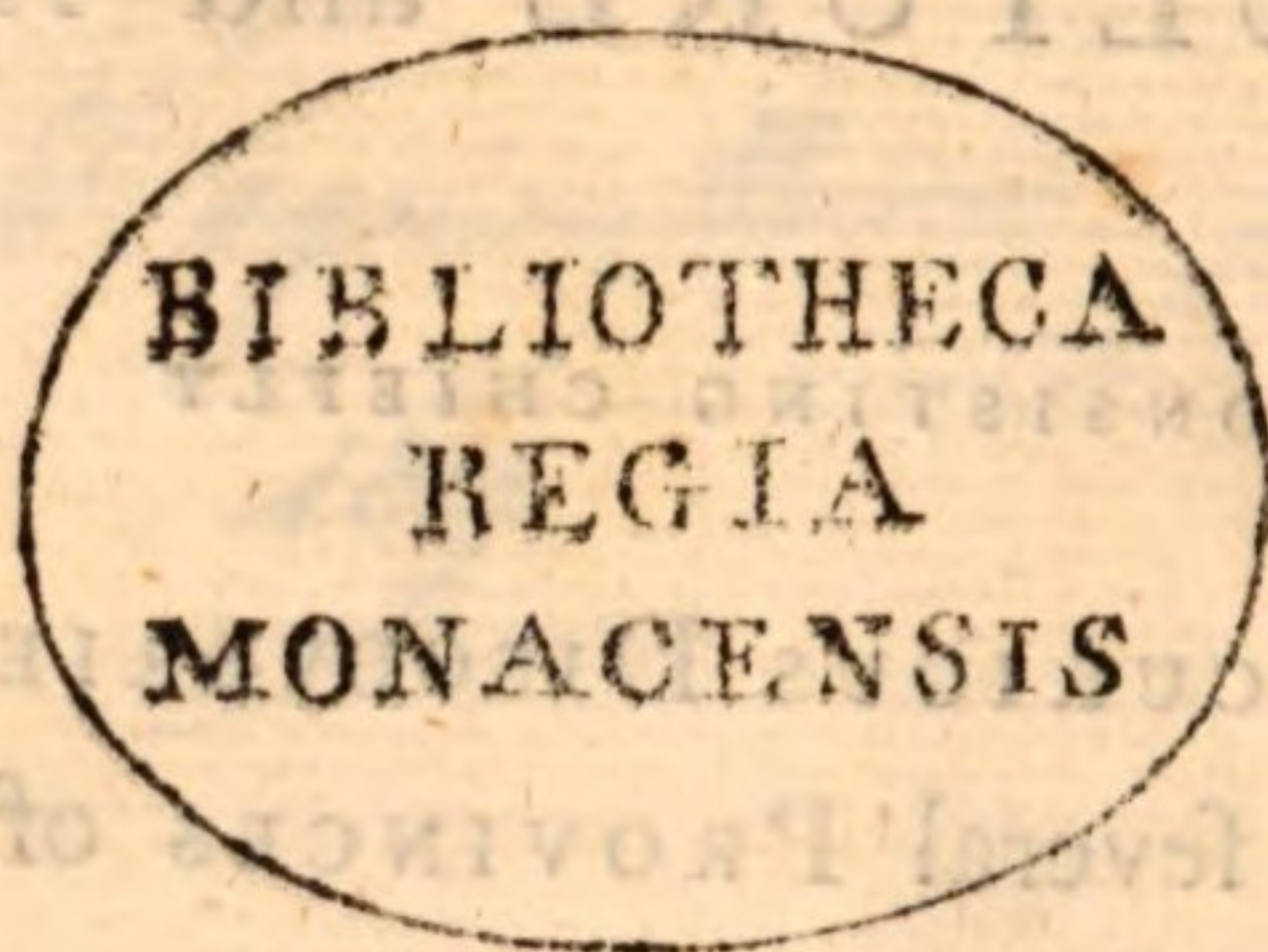
Printed for R. DAVIS, in Piccadilly; L. DAVIS and C. REYMERS, in Holbourn; J. NEWBERRY, and J. WILKIE, both in St. Paul's Church-Yard.

MDCCLXVI.

FOREIGN ESSAYS

ON

AGRICULTURE and ARTS.



Of the most curious and interesting made in the several Provinces of

GERMANY, SWITZERLAND, &c.

AND

Communicated by the Learned in those Countries

For the Improvement of

BRITISH HUSBANDRY.

With Observations by the Translator.

L O N D O N

Printed for R. Davis in Piccadilly; L. Davis and C. Rar-
mers, in Holborn; J. Newberry, and J. Warner, both
in St. Paul's Church-Yard.

MDCCLXXVI.

C O N T E N T S.

ARTICLE I.	Page
<i>An Account of an Experiment, to ascertain the difference betwixt the Wool of Sheep folded during the winter, and of Sheep kept under cover in that season; made by the order of Mr. De Brou, Intendant of the Generalité of Rouen, in Normandy.</i> - - - - -	1
<i>Observations on that Experiment.</i> - - - - -	4
ART. II. <i>An Essay of the Lentil of Canada, preferred to all other pulse for feeding horses and black cattle, the culture of which is lately introduced into France, by M. Dumesnil Costé, of Normandy.</i> - -	6
ART. III. <i>A treatise on Lodged Corn, with the means of preventing that misfortune; written by M. J. Bertrand, of Switzerland.</i> - - - - -	10
ART. IV. <i>Observations on the Harvesting of Corn, with the methods practised about Geneva, and the lower Dauphiné; by M. le Marquis De Costa.</i> - -	19
ART. V. <i>An Essay on the Culture of Madder, including a newly discovered method of using the Green-root in dying; by M. Dambourney.</i> - - - - -	29
ART. VI. <i>A farther account of the culture of Madder in large, written since the last article, together with some cursory remarks on the culture of Madder by seed alone; by M. Dambourney.</i> - - - - -	41
ART. VII. <i>Extract of a Letter from M. Michel, Secretary to the Society of Agriculture established at Beauvais, to M. Dambourney, dated Dec. 2, 1762.</i>	50
ART. VIII. <i>An essay on the culture of Weld, or Dyer's Weed, now very little cultivated in England, written by M. Dambourney.</i> - - - - -	51
ART. IX. <i>An essay on the Culture of Saintfoin, with some curious observations and experiments respecting the nature and properties of Marle, by M. le Chambrier, de Travanet, Treasurer-general of the principality of Neufchatel, and honorary member of the Bern Society.</i> - - - - -	55
<i>Result of the several preceding Experiments.</i> - - -	67
ART. X. <i>An essay on the best method of marling and managing poor Lands; intended as a supplement</i>	

to the preceding piece, and written by M. Jeanneret the elder. - - - - -	69
A R T. XI. <i>An account of the culture of the Virginian Plane Tree, for its use and beauty recommended by M. Miller; being an extract of a letter from M. de Waldner, a Lieutenant Colonel in the French service. Dated October 8, 1762.</i> - - - - -	75
A R T. XII. <i>An essay on the advantages resulting from the cultivation of a sort of Wheat to be procured in Silesia; written by M. Dumesnil Costé.</i> - - -	80
A R T. XIII. <i>An essay on the Preservation of Grain, containing a method of keeping it, advantageous as well in respect to the Quality as Quantity. Written by M. Marcet de Mezieres, of Switzerland.</i> - - -	81
A R T. XIV. <i>An essay on the Observations which might be made respecting the Variations in the Atmosphere accompanying and preceding the different Seasons of the Year. Written by M. F. Micheli du Cret, Member of the Council of Two Hundred in the Republic of Geneva, in a Letter to *****.</i> - - - - -	88
A R T. XV. <i>Enquiries into the Nature of such Distempers as make Wheat black, particularly the Smut, properly so called, and the Charbon or Burnt Grain. Extracted from the Elements of Agriculture, written by Monsieur du Hamel.</i> - - - - -	99
<i>Of the Smut, properly so called.</i> - - - - -	100
<i>Characters of the Smut.</i> - - - - -	101
<i>Enquiry into the Causes of Smut</i> - - - - -	102
<i>Methods of guarding against this Distemper.</i> - - -	105
A R T. XVI. <i>Of the Charbon, or Burnt Grain.</i> - - -	107
<i>Characters of the Charbon, or Burnt Grain.</i> - - -	107
<i>Of the Cause of the Charbon, or Burnt Grain.</i> - - -	110
<i>Methods of guarding against this Distemper.</i> - - -	113
A R T. XVII. <i>An account of some Experiments made in the Year 1760, in the Parish of Surcy, the Election of Andely, in Normady, in order to discover the true Cause of Wheat being smutty; with the Means of preventing this misfortune. By M. de Gonfreville.</i> - - -	118
<i>Proofs respecting the efficient Cause of this Evil.</i> - - -	139
<i>A Method of preserving Wheat from being burnt.</i> - - -	140
<i>A simple and easy Method of cleansing Seed Wheat from the</i>	

CONTENTS.

	v Page
<i>the Dust of burnt Grain.</i> - - - - -	142
<i>Observations on ditto.</i> - - - - -	143
ART. XVIII. <i>An Essay on the Culture of Parsneps in the open Field, as Food for Cattle; extracted from several Letters written by M. Le Brigant, Rector of Plouezoch, in Bretagne.</i> - - - - -	154
ART. XIX. <i>The Description of a Siberian Tree, bearing a kind of Peas, and which is very proper to be recommended for Cultivation in the Northern Parts of Scotland. Written by M. de Graffenreid Lord of Worb in Switzerland, and Member of the æconomical Society at Berne.</i> - - - - -	148
ART. XX. <i>The Culture of the great red Clover, as practised in Bretagne in France, being the Method recommended by M. le Baron de Pontual.</i> - - -	153
ART. XXI. <i>Observations on the culture of Lucerne, as sown by several Members of the Society for promoting Agriculture, established by the States of Bretagne.</i> -	156
ART. XXII. <i>An Account of an Experiment of sowing Clover on Rye in the Spring; made by Mons. Tscheffeli, Vice President of the Oeconomical Society at Berne.</i> - - - - -	159
ART. XXIII. <i>An Experiment to try whether Lucerne and Dutch Clover will bear transplanting; made by the same Gentleman.</i> - - - - -	149
ART. XXIV. <i>An Essay on the best method of improving old worn-out Pastures by plowing. Written M. Tschiffeli, Vice President of the æconomical Society at Berne in Switzerland.</i> - - - - -	191
ART. XXV. <i>An Essay on the question, Whether the several kinds of Plants require the same Nourishment; by Monsieur du Hamel; in a Letter to the Authors of the Foreign Essays on Agriculture and Arts.</i> - -	170
ART. XXVI. <i>An Essay on the constructions of Highways; by M. Fr. L. Haldimand, Secretary to the Bailiwick of Yverdon in Switzerland.</i> - -	180
<i>Of constructions of Highways.</i> - - - - -	181
<i>Of keeping the Roads in repair.</i> - - - - -	194
<i>Remarks on the Utility of Public Roads.</i> - - -	195
ART. XXVII. <i>A Letter to the Authors, relative to the Lentils of Canada.</i> - - - - -	198

ART. XXVIII.	<i>Some remarks on the foreign method of mowing Wheat, in a Letter to the Authors.</i>	- 199
ART. XXIX.	<i>An Essay on the Culture of Coleseed as practised by the Flemish Farmers, written by the Marquis de Turbilli.</i>	- - - - - 202
ART. XXX.	<i>Some Queries respecting the Silesia Wheat, to which is added, a Comparison of the Expences of its Culture and Produce with the English Wheat, contained in a Letter to the Authors.</i>	- - 214
ART. XXXI.	<i>An Essay on the best method of making Butter, on the management of a Dairy, and salting Butter for keeping or exportation. Written by Mr. Jore, Secretary to the Society of Agriculture, established at Rouen in Normandy.</i>	- 219
	<i>Observations made at Merval, on the manner of making Butter in the Country of Bray.</i>	- - - - - 220
	<i>Of the neatness and cleanliness required in making Butter.</i>	228
	<i>Of the Uses to which the Skimmed Milk, Butter Milk, &c. are applied.</i>	- - - - - 229
	<i>Of the method of salting Butter.</i>	- - - - - 230
ART. XXXII.	<i>An Essay on the planting of the resinous Pine Tree, on the seemingly barren Parts of the Royal Forests, on sandy Plains and Heaths, compiled from the Papers of the late Mr. Rondeaux, of Rouen in Normandy.</i>	- - - - - 234
ART. XXXIII.	<i>An Account of an Experiment of sowing Lucerne on a Stubble, made by M. Tschiffeli, Vice President of the Oeconomical Society at Berne.</i>	- 238
ART. XXXIV.	<i>An Experiment to make Lucerne thrive in a poor Soil without Manure, by the same Gentleman.</i>	- - - - - 240
ART. XXXV.	<i>An Essay on the Question, whether all Plants extract from the Earth the same nutritive juices. Written by Mr. Engel, President of a Committee of the Oeconomical Society at Berne.</i>	- - 241
ART. XXXVI.	<i>An Essay on the Naturalization of Foreign Trees and Plants in Switzerland; written by Mr. de Graffenried, Lord of Worb.</i>	- - - 177
	<i>A List of several Foreign Trees and Plants, which have been four Years growing at Worb.</i>	- - - 285
	<i>A List of several Plants which were killed in 1761, by the severity of the winter, not having been covered.</i>	287

CONTENTS.

vii

Page

ART. XXXVII. <i>Practical Directions for cultivating Flax, adapted to the Climate of Switzerland. By Mr. Tschiffeli.</i>	288
<i>What land is best for Flax.</i>	288
<i>In what manner grass grounds and pastures are to be prepared for sowing Flax.</i>	289
<i>The manner in which land already in tillage should be prepared, when Flax seed is to be sown the second year after the fallow.</i>	290
<i>What manure is best adapted to the nature of the Flax.</i>	291
<i>In what manner, and when Flax should be weeded.</i>	292
<i>In what manner and at what time Flax is to be pulled</i>	293
<i>In what manner the seed is to be separated, and what is afterwards to be done.</i>	293
<i>Of grassing Flax.</i>	295
<i>At what time and in what manner it is proper to brake Flax.</i>	295
<i>Precautions to be observed in beating Flax.</i>	297
<i>An observation of great importance respecting the hackling of Flax.</i>	297
ART. XXXVIII. <i>An Experiment to make Potatoes thrive without Dung by Mr. Tschiffeli.</i>	298
ART. XXXIX. <i>An Experiment of sowing Bere, or Winter Barley, in Autumn, to serve as green Fodder for Cattle in the Spring, by the same Gentleman.</i>	299
ART. XL. <i>The Farmer enriched by artificial Pastures, or the true Application of cultivated Grasses, so as to improve and encrease the Value of Land. by Monsieur de L'Harpe of Switzerland.</i>	306
Chap. I. <i>Of the Advantages to be derived from artificial Pastures.</i>	305
Chap. II. <i>Of the artificial Grasses which are most commonly cultivated, their several qualities, the crops they yield, their duration, the choice of soil for them, and the several preparations necessary for their culture.</i>	310
Chap. III. <i>Of the Necessity there is of forming a new Plan of Husbandry: The Principles of this Plan explained.</i>	321
Chap. IV. <i>Method of reducing Land into this mode of Culture, and keeping it regularly in it.</i>	330
Chap. V. <i>Shews how much this Culture is superior to that generally practised.</i>	337

C O N T E N T S.

viii

Page

Chap. VI. *The principal Objection, which may be formed to this Plan of Husbandry, answered.* - 345

ART. XLI. *An Account of the method in which the estate of Aspi, near Aarberg in Switzerland, was improved, written by Mr. Tschiffeli.* - - - - 351

ART. XLII. *An Essay on the means of preventing Smut in Corn, written by Mr. B. Hercules Sprungli of Lipperswyl, in Thourgovia, Switzerland,* - 388

ART. XLIII. *Account of a Lixivium, which the Farmers of the Country of Nideau, in Switzerland, make use of, to prevent their Corn from being smutty; written by Mr. N. E. Tscharner, Secretary to the Oeconomical Society of Berne.* - - - - 360

ART. XLIV. *A Description of the Hay Harvest in the Environs of Bourgestein in Switzerland. Written by Mr. de B Member of the Berne Society* 362

ART. XLV. *An Essay on the culture of Vines, written by Gabriel Anet, Vigneron (Vine dresser) at Chailly in Switzerland.* - - - - 369

Of the Mixture of Earths. - - - - 360

Method of taking up Vines. - - - - 370

Of the Stock from which cuttings or layers are taken. 371

The Season for planting Vines. - - - - 374

The Method of planting Vines. - - - - 374

Rooted Plants to be preferred to cuttings. - - - - 376

Method of procuring rooted Plants. - - - - 277

Methods of manuring Vineyards. - - - - 378

Of the culture or tillage which Vines require. - - 379

ART. XLVI. *An Essay on the culture of the African Millet, Sorghum, milium nigrum. Written by Mr. Tschiffeli.* - - - - 385

ART. XLVII, *An Example of the Partition of a Common in Switzerland, written by M. de Werth, Lord of Toffen, Member of the Supreme Council at Berne, and cheif Magistrate of Vevay.* - - - 388

FOREIGN



FOREIGN ESSAYS, &c.



ARTICLE I.

An account of an experiment, to ascertain the difference betwixt the wool of sheep folded abroad during the winter, and of sheep kept under cover in that season.

MADE BY THE ORDER OF

Monfieur D E B R O U,

INTENDANT of the GENERALITÉ of ROUEN;
in NORMANDY.

THE experiments made from the year 1757 to 1760, in the Generalité of Rouen, to ascertain the advantages or disadvantages of folding sheep abroad during the winter, instead of shutting them up in the covered fold, left no room to doubt, but that the sheep folded abroad were more healthy and stronger than the others, and that their fleeces were finer, softer, and whiter.

These experiments were repeated in a greater number in the winter of the year 1760, (which was one of the severest that is remembered since 1709, M. de Reaumur's thermometer falling twelve degrees and a half below the freezing point) and they were attended with the like success. Some of the

NUMB. I.

B

ewes

ewes dropped their lambs in this severe weather, without damage to either, though they were left in the open air; on the contrary, these lambs were stronger in the spring, than those dropped by some sheep of the same flock, which were kept in the covered fold; this proves, that nothing can be better for sheep than to keep them abroad.

The next point is to ascertain the degree of superiority, which is possessed by the wool of sheep folded abroad, compared to that of sheep kept all the winter in the covered fold.

M. de Brou, Intendant of the Generalité of Rouen, engaged sometime since a sensible and intelligent artist to make the experiment, under the inspection of another person. This experiment answered in every point, so that they were sorry they had not made it more in large.

It has been since repeated with all due attention to circumstances, and the result is as follows.

EXPERIMENT.

Thirty four pounds twelve ounces of wool of sheep folded abroad were taken, which wool being pulled, was afterwards beat on a hurdle to get out the dust.

In these operations it lost in weight ten pounds four ounces, that is to say, eight pounds thirteen ounces in the picking and pulling, and one pound seven ounces in the beating; so that there remained only twenty-four pounds eight ounces.

The like quantity was taken of the wool of sheep kept in the covered fold, which in the same operations lost eight pounds twelve ounces, that is to say, seven pounds twelve ounces in picking and pulling, and one pound in beating, so that there remained twenty-six pounds, or one pound eight ounces more than of the other wool; it will, however

ever, be found in the sequel, that there is upon the whole less waste in the wool of the sheep folded abroad, than in the other.

[By some experiments since made, it is found that the fleeces of the sheep folded abroad are considerably finer and heavier, than those of sheep sheltered during the winter season; the first mentioned sheep having about a fourth part more wool on them.]

When this was done it was observable, that the wool of the sheep folded abroad appeared whiter, less dry, and something finer grained than the other.

Twenty-three pounds of each of these sorts of wool were combed and spun for the warp, and six pounds of oil were used to each quantity. The wool of the sheep folded abroad, yielded nineteen pounds of thread, and the other wool sixteen pounds, that is, three pounds less; and it was also observed, that the thread of the last was something coarser than the other.

For the woof, thirty pounds of the wool of the sheep folded abroad were taken, which being beat, picked, and pulled, there were six pounds eight ounces waste, that is to say, four pounds in the picking and pulling, and two pounds eight ounces in the beating, so that there remained twenty-three pounds eight ounces.

In like manner thirty pounds of the other wool were taken; and there were nine pounds eight ounces waste in the picking and pulling and beating, that is to say six pounds eight ounces in the picking, and three pounds in the beating; so that there remained neat only twenty pounds eight ounces, being three pounds less than the first mentioned wool produced.

That the weight might be equal eight ounces were added to one, and three pounds eight ounces to the other, so that there were twenty four pounds of each.

These parcels were delivered to be carded and spun, after having been each greased with five pounds of oyl. When they were spun they each weighed twenty seven pounds, but the thread of the wool from the Sheep folded abroad was somewhat finer, than the other in the proportion of 74250 to 69750 which was evident from the length of thread each produced. It is to be noted that both parcels were carded and spun by the same person.

In order to weave this into stuff, seventeen pounds eight ounces of the warp spun from the wool of the Sheep folded abroad was put into the loom, the width consisted of 1134 threads, this took eighteen pounds ten ounces of the wool, and the piece was thirty two ells and a half long, and an ell wide within a thirty second part.

This piece of stuff after having undergone the various operations requisite to dress it, was reduced to the length of twenty five ells and a half, and was in width only five eighths of an ell.

The thread spun from the other sort of wool having been managed in the same manner, the piece of stuff wove from it, after being dressed was only twenty four ells and a quarter long, and five eighths of an ell broad; so that it was an ell and a quarter shorter than the piece made from the wool of the sheep folded abroad.

OBSERVATIONS ON THIS EXPERIMENT.

[The principal motive for laying this paper before the English reader, is to convince him, that the old method of folding sheep abroad is by far the best. Our husbandry, tho' better practised than perhaps in any part of Europe, will still admit of great improvements; yet should we not be too fond of every new scheme offered to our notice. Covered
tolds

folds have been of late recommended under a notion that the dung saved in this manner, might be more profitably applied to use, than when it is as it were indiscriminately scattered from the tails of the sheep, and it has been also suggested that the fleeces would become finer by the help of the covered fold, as the sheep would perspire more, but the above experiment entirely controverts this opinion, and as to what relates to the dung, we are convinced it is in the manner we now apply it a good manure, and as we are not sure it would turn out to more advantage when saved in a covered fold, it would be madness to adopt that practice when we know, or may know at least, that by lessening the wool both in quality and quantity we should be certainly losers by it.]

Every part of this experiment was conducted with the greatest care and attention, and by the same persons. By the account which has been just given, it should seem that the wool of the sheep folded abroad is to be preferred. This wool was at first finer and softer, there was less waste in working it, and the thread was also when spun finer than the other: these are essential advantages.

The stuff made of the wool of the sheep folded abroad was an ell and a quarter longer than the other, and was also finer and whiter: this difference was very easy to be perceived. We may reasonably then conclude, that folding sheep abroad improves their wool greatly.

If we adopt this practice which is common in England, we may have reason to hope that our wools will every year be finer and softer; yet as a great deal depends on the breed of the sheep, it were to be wished that we could get some Spanish and English sheep to breed from. Mr. de Brou is very willing to encourage those who may import such sheep and will reward them in proportion to the number they bring into his Generalité.

We

[We see by the last paragraph that our neighbours and natural rivals are making every possible attempt to aggrandize themselves at our expence; they even offer rewards for transporting live sheep from England though contrary to our laws; should we not then exert ourselves to the utmost lest they at last carry their point; let us apply diligently to the improvement of agriculture, and an encreased trade must be the consequence.]



ARTICLE II.

An Essay on the Lentil of Canada, preferred to all other pulse for feeding horses and black cattle, the culture of which is lately introduced in France, by

M. DUMESNIL COSTE¹ of NORMANDY.

I HAD sent me from Canada a kind of seed, which may be called a lentil feed. It is a species of vetch, with white seeds inclining to yellow, somewhat resembling garden peas when they are dry.

The seed is round, yet a little flatter than the seed of the vetch, its shape, leaf, and flower, exactly resemble the common vetch.

It supplies the Canadians with a sweet and wholesome food. By cultivating it in Europe, many advantages would accrue; it would be very useful when bread was dear, and would supply the poor with a kind of food, as wholesome as it would be cheap. It is besides an excellent fodder for horses and other cattle,

A small quantity of this feed would support a man, and there are many ways of preparing it for food.

This

This plant requires no other culture, than what is bestowed on field-peas and vetchs, being sown in April in the open field.

Many experiments have been made on the culture of this plant, by several gentlemen to whom I gave the seed.

Mr. Fiquet in the spring of the year 1762, sowed a handful of it in his garden at Normanville, in the district of Caux; it yielded him a return of forty-eight for one, and he had besides two large bundles of fodder, which was fine, tender, and exceedingly well adapted to the feeding of horses and cattle.

This is an evident proof, that the lentil of Canada yields an encrease abundantly larger than any other plant cultivated in the open field.

A part of these lentils was sent to the kitchen to be boiled, and it was found they boiled readily, had the same taste as the best common lentils, and were as easy of digestion.

M. Toustain de Frontesbosc, caused a middling handful of these lentils to be sown in a bed of his kitchen garden at Limesy in the district of Caux. It was in the month of April 1762, and the quantity of ground might be about half a rod.

By the month of September when the crop was cut, the plants had attained the height of five feet and upwards, making three quarters of a sheaf such as are made in that district, which generally measure five feet and a half in circumference, are hard bound, and commonly weigh immediately after mowing from thirty five to forty pounds, though when dry they are reduced to 25 or 28 pounds.

This sheaf yielded a large increase, and some of the seed being offered to horses was greedily eaten by them. The produce of it was near half a peck of seed.

Monsieur Toustain has made the following remarks on the occasion.

“ This

“ This lentil was not attacked by the fly, which at the same time devoured all the peas and vetches in the district of Caux. This advantage which the Canada lentil has over the sorts of pulse I have mentioned, is of great consequence.

“ Supposing half a rod or perch of land produced as above three quarters of a sheaf, an acre of land containing an hundred and sixty perches, would of course yield two hundred and forty sheaves.

“ It is probable, however, that the product of this lentill would not be so considerable if it was sown in the open field; yet it is to be presumed it would produce more than either pease or vetches, which in the above district in the most favourable years do not yield more than about one hundred and forty sheaves on an acre.

“ This lentil produces more cods, or pods than the common vetch; the three quarters of a sheaf yielded near half a peck of seed, of course eight sheaves at most would yield a bushel, whilst above a dozen sheaves of peas or vetches go to produce a bushel of feed.

“ It is to be presumed, that this lentil would yield in the same proportion more than peas or vetches, if it was sown in the open field; the earth there being less divided, and abounding less in vegetative juices than in a kitchen garden, the plant would not grow so high, but running less to stalk would produce more feed.

“ The nature and quality of the seed constituting the principal excellence of fodders, this lentil, which is sweet and pleasant to the taste, should of course be more wholesome to cattle than other kinds of pulse, and ought to be preferred to them, particularly in such countries as have not a soil well adapted to grey peas, such as the district of Caux, where they generally sow a third part, or even half the quantity of vetches with their peas.

“ The

The grey pea is in flavour greatly inferior to the lentil, and the taste of the vetch is bitter and disagreeable; and it not unfrequently happens that horses which are fed in the stable with vetches alone, lose their hair in winter.

The people of Flanders, who are very good farmers, and breed a great number of horses for sale, are accustomed in some of the provinces to feed them with a small lentil much cultivated there, but which is probably greatly inferior to the Canada lentil.

To conclude, if this plant possesses such advantages, with regard to its being so well adapted to the feeding of cattle, and to its large produce; it also presents to our consideration another benefit much more worthy our attention, affording an excellent food for the poor; this property which tares and other such kind of pulse enjoy not, gives the Canada lentil the same superiority over them, as wheat has over rye, barley, oats, and other grain, in value and price.

So many advantages possessed by this lentil should certainly induce our farmers to cultivate it, and after the result of these experiments, which were made with great care and exactness, they cannot doubt of success; and if they do succeed on an extended cultivation, the Canada lentil will probably be substituted to every other kind of pulse now sown in the field.

Mess. Toustain de Frontebosc and Fiquet will not rest satisfied with the success they have had in cultivating this lentil in their gardens; they intend, like lovers of their country, to try what may be expected from the culture of this plant in the open field, that they may extend the use of it to feeding horses and other cattle.

They have been even induced to attempt sowing a small quantity of this seed in the month of October, a gentleman having observed some plants of

this lentil remain, during the whole winter, in his garden, without being ever attended to, and come to maturity in the month of May following.

The success of this experiment would give us a new winter lentil, which we should value the more, as it would be forwarder than any other kind of fodder, and might even be an intermediate crop.

[The writer of this essay means by intermediate crop, that this lentil might be sown soon after harvest, and be got in early enough to sow spring corn in May. How far this is practicable in our climate, experience will best inform us.]



ARTICLE III.

A treatise on Lodged Corn, with the means of preventing that misfortune; written by M. J. BERTRAND of SWITZERLAND.

A FRIEND of mine, who is a great lover of husbandry, asked me what he should do, and what precautions he should take to prevent his corn from lodging, or being laid. His land is very rich, and yields great crops, yet is it subject to this misfortune.

I prescribed to him the remedies which I am now about to lay before the reader. The subject is in itself of great importance.

Many farmers who are possessed of prime land, suffer very considerable losses, by the quantity of corn which they have yearly lodged; for the ears that fall scarcely ever ripen or perfect the grain, which is in this case generally small, shrivelled, and starved, the vessels in the stalk being obstructed, the free course of the sap is consequently impeded, if not totally stopped.

In

In these rich lands, the cause of this misfortune is their being too free of their nourishing or vegetative qualities. Though the stalks of corn are ever so well nourished, yet when they have not a sufficient elasticity, if they have imbibed too much moisture, or that the heat is not great enough to dry them, and continually extract the superfluous watery particles, as soon as the corn spindles, the stalks not having consistence enough to keep themselves erect, bend easily with every high wind, or whenever the large blades are wet with dew or rain.

This is the cause of the disaster: the remedies follow.

I. It is absolutely necessary that the land should be cleared of all superfluous water, at least as much as possible, either by making open ditches or covered drains, deep enough for the plow to go safely over them. If stones are not at hand to put into these drains, small faggots, or any kind of brushwood may serve, but the faggots will do best, and last longest, if cut in the winter season.

These are to be laid at the bottom of the trenches, over them straw, and lastly the earth.

If the ground has a natural slope, it must be humoured in making these covered drains, and the water must have an easy fall.

II. These lands are always best plowed high, even in ridges, or in narrow high raised stiches, according as the soil is more or less damp.

III. If the field has a slope, the furrows must not either cross it horizontally, or go up and down, but they must have an easy fall obliquely down, so that the water may run gently off without carrying away the fine earth, or the vegetative particles which are mixed with it.

When land is thus circumstanced, this precaution is absolutely necessary, so that it cannot with any degree of prudence be neglected.

IV. The farmer must not be sparing of his water-furrows, and they must be so disposed as best to answer the purpose for which they are intended.

V. By plowing deep the superfluous moisture is naturally carried downward, and the roots of the plants, instead of being surfeited with it, are only gently moistened, and moderately refreshed.

VI. The deep autumnal plowing, in which the furrows should, if possible, be drawn from east to west, and the summer cross plowing, may also much contribute to prevent this misfortune, by promoting the attenuation, or division of the particles of earth.

VII. Such lands as these must in particular never be plowed in rainy weather, or when they are wet, though they should not even be wet enough to rise in clods. It is much better to defer the plowing some time longer, even if the farmer should be obliged to give the two last plowings, one after the other, successively, without any intermediate space of time being allowed.

In these rich lands we shall do well to remember Virgil's precept of plowing and sowing dry; if we do not, our corn will not only be in great danger of lodging, but may probably also be smutted, for rich lands are most subject to the smut.

VIII. When the frosts come on, and the earth is full of water, the wheat is lifted, more or less, out of the ground; this weakens the plant, by exposing some of its roots to the air; indeed they are often totally uncovered.

This may be remedied, by passing a heavy roller over the corn in dry weather in the spring of the year; but then the field should have been deep plowed. Nevertheless, if the corn should stand in need of being weeded, which, however, it never should do, the rolling may be dispensed with; the weeders will earth up the plants sufficiently, by walking

walking over the land, and plucking up the pernicious inmates.

IX. When wheat is too strong and vigorous in the spring of the year, it will infallibly be lodged before harvest. The corn in this case will find moisture in abundance, but too little true vegetative nourishment. Tull recommends, that the plants should, when this happens, be thined, either by hand, or with a weeding-hook; this answers well, but it is expensive.

I saw a field in the year 1760, where the wheat plants came up much too thick. In the spring a harrow was drawn over one half of it. The weather was cloudy, and the earth rather dry than moist.

At harvest-time, the crop of this part was much more considerable, than on that which had not been harrowed. I am apt to think this method is better than mowing wheat in the spring, or feeding it down with sheep.

It is true, in the latter cases, the wheat will not be lodged, but then there will be a great number of barren ears; they make, indeed, a fine appearance whilst growing; but examine them, and you will find numbers of the chests empty, and without any grain in them.

This may be depended on, as I write from experience.

X. I would not bury the seed so deep in moist soils, as I would in those which are drier. This at least is certain, trees planted deep in such soils do not thrive.

XI. All hot manures, such as the calcarious earths, and absorbent substances, ashes, soot, tanner's bark, brick rubbish, burnt clay, lime, rubbish from old buildings, shells, and shell marle, agree extremely well with such lands as those I have mentioned above.

The

The manure, however, should be laid on sparingly, be well spread, and equally dispersed all over the land; in moist soils it wastes slowly.

XII. I should be willing to try, whether such land might not be plowed and cropped for several successive years without resting.

If the farmer has plenty of dung, he might very safely sow alternately wheat, rye, or bere, and the several sorts of spring corn, provided he always plowed up his eddish immediately after harvest, and the fallows might be sown with cole seed, turnips, or planted with madder, if the farmer did not think it would too much impoverish his land.

XIII. On these rich lands it has been for some years the custom to sow winter barley, or maslin, for the second crop, instead of spring corn; and this, I think, for many reasons good husbandry.

My opinion is, that the square barley, big, or bere, is a more profitable crop than summer barley or oats; and tares also yield an excellent fodder. But if the farmers, who prefer these crops, should attempt to sow them on one earth, they will do wrong, and suffer accordingly, as this is never done by the good husbandmen, whose example they would wish to follow. Two earths at least must be allowed, the first plowing to be given immediately after harvest. The stubble being buried, serves as a manure, and is ready carried on to the field.

The second plowing is for the seed earth; and, if the season should be so unfavourable, as to prevent the land from being plowed immediately after harvest, the plowing may be deferred, without any bad consequences, till it is convenient, even till near seed time, when the two plowings may be given at one and the same time, provided the farmer has the precaution to burn the stubble.

If two earths were not in this case allowed, the soil would be much more impoverished, and would not

not be by far so replete with vegetative juices; by which means the corn would be weakened, and the stalks would not have that springyness, which is so requisite to them.

XIV. A careful steeping of the seed will also in some sort be a prevention to this misfortune. Good seed, well chosen, changed from time to time, and carefully prepared, produces plants that are more vigorous, stronger, and better conditioned, than when these precautions are omitted; there is nothing more certain than this.

Yet a modern writer (the piece here referred to, was published in the transactions of the Bern society) willing, as he says, to reduce agriculture to its first principles, thinks very differently.

Under the head of sowing, he advances several paradoxes contrary to the experience of all farmers in all countries.

In the first place he pretends, that wheat intended for seed should be cut green, saying, that no flour is wanted from this corn.

Secondly he asserts, that it is sufficient simply to change the seed, by buying it chance medley in the market, without making any enquiry about the place of its growth, &c.

Lastly, he says, it is quite unnecessary to give any preparation to the seed, to promote its first shoot.

But who will believe that a germ half formed, can give birth to a perfect grain; and that a grain which has not arrived at a state of maturity, can supply its germ and radicles with the quantity of nourishment, they will in the infant growth of the plant have occasion for?

Who will be persuaded, that a change of seed made in the negligent manner this writer mentions, can be of any great use? neither does he assign any reasons in support of these his extraordinary maxims, which are entirely different from the practice of every prudent

prudent farmer, and the gardeners, who are supposed to understand best the refined parts of husbandry, adopt quite contrary maxims.

This writer does not, it is true, absolutely deny the good effects resulting from the preparation of the seed, according to some experiments lately made, in hastening the germination, guarding against the depredations of insects, and defending the crop from the smut, but he makes very light of their assertions, who say that the small quantity of ashes and lime used in steep, can any ways conduce to strengthen the plants, or augment their produce.

It cannot be denied, even by this writer, that the lobes and radicle of the seed at its first development are easily affected, either one way or the other, to their injury or benefit? These parts are at that period so very weak and delicate, that a trifling quantity of salts and absorbents may have a lasting effect on them; and it is universally acknowledged that the future well being, as well of plants as of animals, in a great measure depends on the first nourishment that is given them, and the first care and attention that is bestowed on them.

But to have done with this seeming digression.

XV. In rich soils the seed should be thinly spread on the land, if the farmer would secure his crop from being lodged.

When corn comes up too close and thick, the crop often abounds more in straw than grain, and the best of soils will yield but a small increase, when the plants stand so close as to starve and choke one another, for they must then be all in a languishing feeble state; but if on the contrary, the farmer is on such soils sparing of his seed, the wheat will have room to branch and spread, the stalks will be strong and vigorous, and the crop will support itself stiffly against the wind.

Nothing is more easy than to ascertain the quantity of seed which a field will require.

The

The best way is to make some small experiments, in order to judge how much the quantity usually sown may be safely diminished. Chuse a well prepared piece of ground, sow one part of it thin, and the other thick, and compare the crop of each with the other.

By repeated experiments on various soils, the farmer may soon learn, without risking any great matter, how much seed the several kinds require.

XVI. Early sowing may also contribute to the prevention of this evil.

When the exterior parts of the plant are stopped in their progress by the cold, and their growth checked by the snow and frost, the minute interior parts, the roots, the fibres, and the mouths by which they extract their nourishment, are strengthened and increased in proportion to the degree of vigour and strength which the plant possesses, and enabled by this means to put forth in due season, stalks that will not give way to every blast of wind.

XVII. The right of commonage claimed in many parts, contributes in several respects to weaken the straw of wheat. The farmer, fettered by a savage and unjustifiable custom, cannot till his field when he pleases, nor husband it in the manner he thinks best.

He cannot plow in the stubble immediately after harvest, to sow winter barley; he is not permitted to sow turnips when his crop is off; he must not turn up his stubble before the winter, to prepare the land for the reception of the spring corn; he must not plow his fallows early in the spring; and, indeed, it should seem that the more care he takes to get his lands into proper tilth, the more are they poached, trampled on, and spoiled by the permission which this barbarous custom gives the commoners of turning cattle on at all times of the year, but when the lands are in crop, even when they are co-

vered with water. It is certainly then ardently to be wished that this evil was totally removed.

XVIII. Sometimes wheat will be lodged on account of its suffering from frost, or snow, in the spring; or from the water which has formed lodgements in the flats.

When frost comes after plants have made their spring shoot, it breaks their delicate fibres, and obstructs their vessels, particularly if they are in a moist situation. This naturally weakens them, and hurts their future growth.

To prevent this, the furrows of the seed earth should be, if possible, drawn from north to south, and the land should be so disposed that the water may not any where find a lodgment.

XIX. Wheat is also lodged in certain places on account of its being surrounded by bogs or woods, from whence at all times there arise cold vapours, which every now and then retard, or entirely suspend the course of the sap, and check the vegetation.

The remedies here are draining the bogs, and cutting down the woods, from whence these pestilential vapours are exhaled.

XX. The best land is sometimes subject to have lodged corn, by being exposed to certain strong winds. Such fields should be sheltered by high quick hedges, or by trees planted on the side whence the winds blow.

It cannot escape the notice of the reader, that in these observations I have passed over all poor light lands, as on such the farmer can never expect to have strong wheat.

This evil may however, even on such land be in part guarded against, by laying the seed three inches deep, by deep plowing, by dressing it only with strong manures, and very rotten dung, by rolling the land with very heavy rollers, immediately after it is sown, and again about the month of April, if

if the plants seem root-fallen or hoven; and lastly, by sheltering the crop from drying winds.

I am well convinced, that if farmers who are subject to have their wheat lodge, will attend to the rules I have laid down, and put them in execution, they may not only guard against this misfortune, but also against the smut, by which so many fine crops are spoiled.



A R T I C L E IV.

Observations on the Harvesting of Corn, with the methods practised about GENEVA, and the lower DAUPHINE, by M. LE MARQUIS DE COSTA.

I INTEND not to present any new system to the readers; these, though ever so well formed, generally meet with invincible obstacles, when they come to be carried into execution. What I would recommend is a method of harvesting grain practised in France, Italy, and in many parts of England. In order to set the advantages of it in the most favourable light, I shall first just mention the manner in which the corn is harvested in the neighbourhood of Geneva, and shall then make some remarks on the defects of it; being sensible that the same defects, though probably with some slight variations, subsist in many entire provinces of large extent.

When this is done, I shall also briefly describe the manner in which the grain is harvested in the lower Dauphiné, to which will succeed some few remarks on its obvious advantages.

When we consider how much inclined mankind is in general to promote a particular interest, it is indeed astonishing to reflect how slowly agriculture

has been improved, though constantly cherished and protected by a mild government.

Were the causes of this slow progress explored and laid open to the public view, it might be of great service in teaching posterity to avoid those rocks, we and our ancestors have split upon.

Among other causes, I may venture to mention those which follow.

First, the difficulties attending good tillage, and harvesting the crops, the losses occasioned by the slowness, with which the several works of husbandry are performed, and the awkward manner of them; expences of repairs and improvements, which the land-owner, who is saddled with a heavy tax, cannot think of without trembling.

It is also certain that an attachment to ancient customs, and the bad impression farmers have taken of the new methods, contribute greatly to this state of languor.

In the present treatise, however, I mean only to mention those difficulties, which arise from the manner in which the corn is in many places harvested, and the very unnecessary expences attending it.

This then is the method of harvesting the corn in the neighbourhood of Geneva.

They reap their wheat; as soon as it is dry, they make it up into sheaves, so large, that a man can scarcely carry one of them; they carry them on carts to the barn, and toss them one by one on the floor.

When the barn begins to be encumbered; the labourers either carry them up ladders, or draw them up with pullies, and lay them in some sort of order: here they are left till winter, the season for threshing, for they thresh none before, except what they want for seed.

When seed time is over, and some other works on the farm, as wood cutting and carting, they begin to thresh.

The

The floor is made of planks, the ends of which are pinned to two oak beams; it is hollow beneath, and forms a kind of a drum, so that the flails rebound, and ease the threshers. This floor lasts but a short time, and costs a great deal.

If the men are early risers, they thresh two or three hours before break of day, by the light of a lamp; which, indeed, is unnecessary, since they have usurped a right of threshing and dressing only five sheaves a day. If they have finished their task at noon, they rest, and no master can exact from them the least service during the remainder of the day.

When they have threshed their five sheaves, they go with great ceremony about dressing them, using a wing, to brush off the cobs.

The corn is then carried to the granary, or else it is screened, and they wait for a favorable market to sell it to advantage.

This is the method of harvesting about Geneva; to which I shall add a few remarks.

They still continue to reap, though many reasons should induce them to mow their wheat. I mow all my wheat.

According to my calculation I save, indeed, only half the expence of labour, but then there are many other benefits attending this practice, and among them, it is not the least, that a farmer can take all the advantages which a fine day offers him, by cutting and housing a great deal of corn in it; thereby shortening the tedious time, which is now in many places allowed for harvesting.

My tenants will not, it is true, as yet, adopt this practice, being attached to a stupid custom handed down to them by their forefathers, though they acknowledge it out of their power to assign one good and substantial reason against mowing of wheat.

The immoderate size of the sheaves is one of the greatest inconveniences attending the method of
harvesting

harvesting I have above described, as it occasions a spoil of young wood, well worthy the serious attention of the government.

These large sheaves can only be bound with long wyths, cut from young plants; and they always prefer the straightest oak or ash for the purpose. They cut these wyths, and carry them off by cart loads; foundation enough, truly, for the many complaints which have been made by writers who have treated on the subject; for the waste and spoil resulting from this pernicious custom, are more than would easily be imagined.

When they make these large sheaves, they lay one gavel with the ears to the right, and another with the ears to the left, so that the ears are exposed equally at each end of the sheaf, and when the men are loading, the rubs and jerks which the sheaf must necessarily have on account of its size, being so disproportioned to the strength of the workman, occasions a great deal of the corn to shale; and even when it is raised towards the man who is loading, he has no other method of getting it into the carriage, but by dragging it up, and afterwards hauling it to the place where it is to lay; this occasions a farther loss.

Thus if we only survey the spot where the carriage was loaded, we might naturally conclude it had been newly sown very thick, for the corn is scattered about in such a manner, that it may be taken up by handfulls.

The same may be said when the load comes to the barn, in tossing down the sheaves, and laying them in order, a vast quantity of corn is shaled, and the barn yard is so plentifully stocked with it, that you will see the very ducks and pigs refuse to eat it, so that it is crushed by the feet and wheels, or lost and thrown upon the dunghill; the jolts of the carriages also, which are at best but indifferent, and

the

the rubbing of the hedges contribute not a little to a farther loss.

Leaving the corn three, four, or five, months before it is threshed, occasions a quantity, which cannot possibly be estimated, to be consumed by the rats.

I have often seen sheaves thrown on the floor quite hacked to pieces by those animals, which never touch the straw till they have eat the corn; there is not a thresher but what sees this every day of his life.

The smallest hole in the roof of the barn, or in the gutters, will presently spoil twenty or thirty of these large sheaves; and they often lay in parts of the barn, where the loss will not be known, till the sheaves are taken down to be threshed.

If the weevils also get into the barn, which is no uncommon thing, the corn will stand a chance of being half consumed before it is threshed.

God defend us from such early rising servants as those I have mentioned; we every day hear of their setting barns on fire by their carelessness; houses, stables, cattle, stock, household-goods, all are consumed in the dreadful conflagration, and it will take a number of years for a farmer to repair his part of such a heavy loss.

We may, amongst the rest of the inconveniences of this practice, mention the hardship of the neighbours who have no occasion to rise so soon; these, if they live near a barn, are kept awake great part of the night by the strokes of the flails.

This custom which the farmers servants have usurped of threshing only five sheaves a day, occasions the masters to have their sheaves made the larger, that their men may earn them the more, so that in threshing five, they thresh as much corn as if they threshed seven or eight of a more moderate size; hence all the disadvantages resulting from large sheaves.

These

These then are the inconveniences attending the method of harvesting above described, and they are doubtless the same in many other places; or if some of them are avoided, they fall probably into other errors of a more dangerous tendency.

I must however say a word or two on the subject of the buildings required on a farm, the repair of which often swallows a great part of the rent.

A farmer who is willing to adopt new methods of husbandry by which his crops may be doubled, is terrified at the apprehension of the expence of building an additional barn; for he cannot expect his landlord will do it, and this difficulty makes him conclude to follow still his old customs, as to adopt methods lately recommended might bring on expences he could not bear tho' they might at the same time increase his crops.

Farm houses, barns, &c. should be built at a moderate expence so as to make them useful; an elegant structure is entirely beside the purpose, it swallows up all the profits of farmers, and discourages proprietors from occupying their own land. But the buildings should not on the contrary be too mean, or suffered to go out of repair; this occasions great discomfort and loss of corn; it is a saving no ways to be commended.

In the lower Dauphiné, their method of harvesting, is as follows.

They reap their corn because they are as yet unacquainted with the advantages of mowing it.

As soon as the corn, having had field room, is dry enough to carry, they bind it into small sheaves, so that about ten will yield a bushel of corn; the bands are made of a little straw taken from the sheaf, and the ears are laid all one way; they load them on a cart, with a coarse cloth laid at the bottom of it. They handle the sheaves however with so much caution, that very little of the corn shales, the rubbing

rubbing is all against the foot of the sheaf, and the jolts of the cart against the hedges do no manner of damage.

When they come to the floor, which is in the open air, they unload the sheaves with the same fork that loaded them, and then proceed to stack them round a pole, about twenty-five or thirty feet high, the ears being all laid inwards, and the lowest sheaves resting on some faggots, to keep them from being injured by moisture.

They then continue to pile them up, widening as they come towards the middle, and afterwards narrowing the stack, till it is brought to a point; the whole, in some measure, resembling the figure of a cone; the outsides are well raked, and the top is capped with some good rye straw, tied fast to the pole.

In this way, the corn is not only secured from the depredations of the rats, which cannot enter it, but from damage by the weather.

They continue then as long as the harvest lasts, making other stacks round the floor, and as soon as all is carried and secured, they begin to thresh.

The floor is made of clay and cow dung mixed, which, having first levelled the ground, they lay on in a thin coat.

The manner of threshing varies much, even in the same neighbourhood.

About St. Marcellin they thresh with Box-tree rods, tied together with ozier twigs, two of the rods being on one side, and one on the other; so that one serves for a handle, and they thresh the corn with the other two. In this way the straw is much broken, and the cattle like it the better for it; women and children all lend their hands.

About Gap, they separate their corn by horses, which they teach to trot lightly over it.

Near Valence they use the flail.

In Piedmont they make horses trot over the corn, drawing after them a large wooden roller, cut in angles like a star, and the angles falling on the corn the whole length of the roller, separate the corn from the straw.

All these methods are very expeditious, insomuch that in a fortnight at most, the largest farm will have the whole quantities of corn threshed, and ready for market.

With respect to dressing the corn, it is impossible any method can be more simple and easy than that which is always practised, where the corn is threshed abroad in the open air.

Every day at sun setting, when there is a little wind stirring, for it is very seldom a perfect calm, one or two men, or more, take the corn with the chaff as it came from the flail, and cast it by shovels full, a-thwart the wind, four or five paces from them; this is done with an easy stroke; all the short straw, chaff, and cobs, are carried on one side by the wind, the corn and the stones that may be mixed with it, fly forward, only the stones being heavier go farthest, the corn falling short in a heap by itself.

The farmers are assisted in harvest, by men who are called Taskmen, these weed the corn, help reap, thresh, and dress it; and instead of being paid in money, they have two bushels out of eleven.

When night comes the taskmen first take their share, then the farmer secures what belongs to him, and in about a fortnight all the corn is got into the granary, secure from the rats, which are destroyed by traps, poison, and cats; and their holes are carefully stopped up.

The straw is again stacked, and being properly raked at the top, very little of it is spoiled by the rain, and that serves for litter. The farmers also stack their hay.

I shall now add a few remarks on this method of getting in the corn.

It must be acknowledged, that a great deal of corn is lost by their manner of harvesting about Geneva, which would be saved, if they adopted this method, so much to be preferred.

Small sheaves have a singular advantage, which is, that if they happen to be wetted by a shower of rain, by setting them an end, they receive the benefit of the air, and one hour's sun will dry them, so as to hinder the corn from sprouting.

The saving of the bands is also an object worth attending to. But these advantages are but trifling, when compared to that of having all the corn safe in the granary in three weeks after harvest, defended from the ravages of the rats, and ready for the market, should an advantageous opportunity of selling it present itself.

If the threshers are not honest, which is too often the case, they have not such an opportunity of pilfering, in working only about a week, in the open air, in summer time when they are thinly clad, as they have in winter, in the barns.

They often thresh in the night, and in retired places; if therefore they only take one pocket full, every time they go home, for the space of three, or four months, it will in the whole, be something considerable.

But all these advantages put together, are little in comparison, to what is saved in buildings about a farm, in the lower Dauphiné.

The buildings about the largest farm, are but trifling; the kitchen is generally the first room, as you go in, a chamber behind it, a stable large in proportion, to the number of horses, and cattle, that are kept, and a loft to keep the hay, in that is cut from the stack, and some straw which they mix with it, to give to their cattle in winter.

In case the farm should be improved, it is pure gain, for all the addition necessary to be made, will be to the stable, and this cannot in reason, be grudged; besides, in case of fire, the loss is not so great, the corn is secure, to rebuild the house, will cost no considerable sum, and the corn being threshed abroad, is not so liable to be set on fire.

I may add, that the winter season, which is dedicated to threshing, is more precious, than is generally imagined; at this time the ditches should be scoured, and the fences made good, the manure should be carried on the land, the wood should be laid in for fuel, and the timber for repairs; and in fact every kind of work, that will conduce to the lasting benefit of the farm.

Of all the farmers to whom I have mentioned this method, which I am endeavouring to introduce, in the neighbourhood where I live, not one can form a reasonable objection to it; only some say, that in the winter time, they give every night, the cobs, to their cattle, and feed them in the day time, with the chaff, and broken ears, as they are thrashed; this advantage they say would be lost, and they add that in summer, their cattle work too hard, to do with such fodder.

In answer to this, I must admit, that some of the chaff will be lost, because the cattle cannot eat it fast enough, and if it is kept, the rats get into it, eat the best part, and spoil and taint the rest. But could not a brick bin be contrived to keep the chaff safe from the rats? Yet even in case this could not be done, the loss after all would not be great, since clover, or Saint foin hay might well, and reasonably supply its place.

I allow also, that men are not so easily got in summer, and that their wages are larger. Yet if hands are scarce, as one man will do the work of two, less will be required; and if a man will thresh
in

In the summer, as much as in the winter, though you double his wages, you save at least, the keeping of one man.

Monfieur Lullin de Chateau-Vieux, told me, that he one year tried to have his corn threshed abroad, and that one man with great ease, threshed fifteen of the large sheaves in a day, which is three times as much as is done in the winter.

To conclude, though many more objections might be made to this method of getting in corn, yet I am of opinion, that they will scarcely have any weight, when compared to what may be said in its favour.



ARTICLE. V.

An essay on the Culture of Madder, including a newly discovered method, of using the Green-root in dying,
by M. DAMBOURNEY.

THOUGH, after what has been written on the subject, by Messieurs Duhamel, and Hellot, it may appear like temerity in me, to treat of Madder, I shall nevertheless venture to lay before the public, some observations I have made, during the four years, in which I have cultivated this plant.

I am well persuaded, that they did not escape the notice of those great men, and if they have not mentioned them in their writings, it has been because the pursuit of objects more new, seemed of greater importance; however like good natured farmers, who have reaped a large crop from their land, they will not be averse to my picking up a few gleanings after them.

Mr. Rondeaux, a member of the academy, found about eight, or ten years ago, two plants of Madder, on the rocks of Oissel, and planted them in his botanical garden. He gave me afterwards several slips,
which

which I planted merely out of curiosity ; but a paper written on the subject by M. Duhamel, opened my eyes, and I plainly perceived the importance of this culture. I applied myself then strenuously to it, and observing all the methods that were laid down with others which appeared to me analagous, I, in the space of four years, obtained a sufficient number of roots, to try the culture of this plant, in the open field.

In this interval of time, I was informed that M. Pierre Dupont cultivated with good success at Elbeuf, some madder plants which he had procured from Lille, in Flanders. He was requested to make me a present of one hundred slips. This little assistance, added to what I had before raised, obliged me to search in my garden at Oissel, for a place to extend this culture ; I found no spot vacant, except two walks, which I broke up to gratify the inclination which was now so predominant in me. I caused one of these walks to be plowed up, and the soil proved to be a yellow clay, with a mixture of sand, under which, at a spade's depth, was a bed of lime stone gravel, which was not broke into.

I divided the walk lengthways, and without using any manure, in December 1757, I planted in one half of it, the slips I had received from Elbeuf, and afterwards, tho' without mixing them, I planted what slips I could get from my own beds.

The other half was sown in April 1758 with some seed I had saved. I cropped in the same manner the rest of my walks, as fast as I could procure either plants or seed, being careful for the first year to keep the beds well weeded, and to lay down the branches as fast as they made any shoots.

In the autumn of the year 1758, I got some seed from the native Oissel plants, as well from what were sown, as from those raised from slips, but the Madder from Elbeuf did not blossom, tho' it pushed forth stalks above three feet in length ; even in the
year

year 1759 it yielded me seed only on a few branches, whilst the Oissel madder gave a full crop. When the stalks were dry I had the curiosity to get some of the roots taken up, which furnished me with some interesting pieces of knowledge.

I. Though it is laid down as a certain fact in the Encyclopedia, that the roots of sown madder are five years before they attain the size, which those proceeding from slips will get in a year and a half, yet I found no such thing, for they seemed equal; and, if there was any difference, it was in favour of the sown madder; both one and the other occupied almost entirely the loose earth on the surface, and often pushed their tap-roots even into the hard bed beneath; but in order to penetrate it, three or four of these roots would wind themselves together, and in passing thro' the crevices of the rock, they assumed whatever form the space would permit them; however when they had got thro' it, and reached a bed of fine pure sand which lay underneath, they reassumed their natural shape and former good condition. In this sand I was obliged to quit tracing them at the depth of four feet.

Experience then convinces us that we should lose no time, but begin immediately to sow our madder; and we are also now satisfied, that this plant may be cultivated with success in land of a very moderate quality, and that even without the assistance of dung.

II. I took the advantage of some fine days, and dried in the sun, but seperately, the roots I had taken up; those from the Elbeuf plants seem on all accounts to merit the preference. They were larger and of a fuller colour than the others; upon being ground they look finer, but they did not answer so well upon trial. I took two skains of cotton, and dyed them, one with each of the sorts of madder in equal quantities; that which was dyed with the native Oissel madder had the most brilliant appearance, and bore without alteration to be boiled thirty minutes,

minutes, when the other would not bear boiling ten minutes.

I afterwards compared the effect of Oissel madder with that of the Lizary, or Hazala of Smyrna, and I found it had greatly the advantage, not only in the brilliancy, but in the solidity of the colour.

From this time, I began to give the preference to this valuable sort of madder. In the year 1760, I sowed what seed I had in the beds of my kitchen garden. I requested M. Rondeaux to assist me in searching for some more of the plants, among the rocks of Oissel and Orival, but he assured me he had several times searched for them there in vain; neither was he more successful in a journey he made thither in August last, with M. Dangerville.

This made me incline to have recourse to the suckers which rise from the roots of the plants; but notwithstanding all the trouble I took to effect it, I could scarcely ever get any that had fibrous roots to them. Though the greatest part of what I planted, had from four to eight inches of yellow root, yet nine out of ten died.

On the contrary, the suckers from the Elbeuf madder have naturally a great many fibres and young roots to them, and they are sure to take, if they are planted in a moist season. Nature seems in this case to make the planter amends for the small quantity of seed which the Elbeuf sort bears, whereas the other yields it in great plenty.

That I might neglect no means of encreasing the quantity of the Oissel madder, I determined to plant some cuttings of the roots; and for this purpose, about the 15th of June last, I dug up a small piece, and out of the roots that were raised, I picked all the runners: these I cut into lengths, each having two knots or buds, and the same day I planted them in drills, where all those which were brown and woody, put forth leaves and roots, but such as were yellow and tender soon rotted.

This

The necessity I was under of planting cuttings, let me into a piece of knowledge which I could not acquire, either from M. Hellot's treatise, or from my correspondents in Holland; namely, from what part of the root the finest colour was extracted.

After all my runners were thus planted, I had still remaining the crowns with lateral and tap-roots to them, resembling both in form and colour large earth worms.

After they had laid three days in the sun they were dry, and the inner skin being shrunk, the outer skin, or bark, seemed to hang loose, to get rid of which, I made use of a method invented by M. Paynel de Darnetal; that is to say, I put my roots into a large coarse sack, in which I shook them well. The rubbing of the roots against the sack and against each other, almost entirely separated the outer skin or bark, which I got quite rid of with the help of a fan. In this manner I procured some truly fine prepared madder, which in its effects as much excels the Lizary, as that does the best Dutch madder. I would not, however, advise the planter to adopt this method, unless he should by chance meet with buyers curious enough to give a price in some sort, proportioned to the waste and trouble which attends this manner of preparing the root.

Thus by taking up all sorts of madder in the spring of the year, we in reality obtain that advantage of getting suckers and cuttings, which M. du Hamel gave us some reasons to hope; and besides, if the weather is tolerably fine, the roots may be enough dried in the sun for them to keep, and the expence attending kiln drying is avoided, as well as the damage which the root sustains by the fire. The colour would be still finer, if the roots were dried in the shade, under a large shed open on the sides, and to accelerate their drying in this manner, I have with good success laid them on a bed of half

burnt bricks. A bed of dry ashes six inches thick may also for this use be laid under the roots, but then the ashes must be covered with a large cloth, on which the roots are to lay, or else when these last come to be turned, the ashes will be mingled with them. A plaster floor will also hasten the drying of the roots in this method, and I am, indeed, inclined to prefer it to a brick floor, on account of the ferruginous particles with which bricks abound.

The chief difference in the Oissel Madder consists in the roots being smaller and of a less brilliant colour, having fewer fibres, and the buds or joints in them being at a greater distance than in the Elbeuf Madder; but by the attentive observer, other differences will easily be discovered.

I. In the spring of the second year it begins to shew itself above ground ten or twelve days before the other sorts; the stalks are slender, and fall to the ground by the time they are a foot in length; the pale green leaves are long, narrow, thin, and waved or undulated at the edges, something like the leaves of laurel; the flowers are clustered, the seeds but few, and what seeds do take are supported by a pretty long pedicle or foot-stalk.

On the contrary the Elbeuf Madder, originally brought from Lisle, and of the same kind as that which the Flemish refugees carried with them into Holland, puts forth strong stalks, with many joints, capable of supporting themselves, though they are two or three feet high.

The deep green leaves are thick, broad towards their base, and terminate in a point something like those of the great myrtle; not being at all, or at least very little, undulated.

The flower does not show itself till the second or third year, is very apt to fall off, but, when that accident does not happen, the seed presents itself somewhat like that of privet, except that its pedicles

cles are short. This seed ripens very well; but it is less valued on account of the ease with which suckers are obtained that are well rooted and furnished with fibres in plenty.

In order to extend my culture, and even in hopes of enriching my plantation with a new kind of Madder, I sent to Smyrna for some seeds of the Hazala, or Lizary; fortunately one of the vessels, in which some was sent to me, escaped the hands of the English, and on the 20th of August, 1760, I received three pounds. It appeared to me to be exactly the same as the Oissel Madder; and I ventured to sow a small proportion of it on the 27th of August on one of the beds in my garden, and without covering: it came up very well, and suffered nothing from the winter.

I transplanted it the February following, and it is now in the summer, 1761, in full flower, and exactly resembles the Oissel Madder, except that its stalks are still more slender.

As to its culture, I scrupulously conformed to the maxims laid down by Mr. du Hamel. I afterwards, however, ventured to differ from him in some points, by trying to accommodate it to the plain methods of country Farmers.

I, in the first place, proved what M. Paynel de Dernétal had said to be true; namely, that the layers, the management of which is very expensive, produce only long, trailing, woody roots, with scarcely any colour in them; are hollow for two years, and yield but very few of those vermicular roots, which alone are valuable. For these reasons, I allowed four times as many plants as I did at first on a given space of ground; the land was well stocked, and the expence of managing the layers saved.

It is impossible to avoid the expence of three diggings, or deep hoeings, the first year, and one in the spring of the second; but that I might fall

more into the method of culture in use in this country, I scattered the plants in rows after the plough in the same manner as peas or kidney-beans are sown, and the workmen, who was accustomed to hoe and earth up these, managed the Madder in the same manner, and with no greater expence.

According to the best observations I have been able to make, the easterly winds in the spring, and the hot weather of the summer, are equally fatal to all the Oissel madder planted in those seasons; on the contrary, all that was planted in autumn succeeded.

In the month of October 1760, I took up all such of my plants as were two years old, and they furnished me with suckers enough to plant a rood of land. Very few of them missed because they were all brown and ligneous, an advantage we are deprived of in the spring, as, at that season, the greatest part of the running roots are yellow, and worth nothing to plant.

But because in autumn the roots cannot be dried so as to keep without the help of fire, it will be proper at that season only to take up as many as will furnish the necessary quantity of suckers, and from June to September, may be taken up what are for sale.

On the sixteenth of February 1761, I sowed the greatest part of the seed of Lizary, I received from Smyrna, and the remainder, a fortnight afterwards in a bed in my garden.

M. du Hamel making very honourable mention of his memoir in the second volume of his Elements of Agriculture, says (speaking of the seed sown in the kitchen garden) that the plants, will be, after the second year, fit to transplant into the open field. This is probably an error of the press, for I always transplanted these young plants with success, two months after they appeared above ground,

In May I took up enough to plant twenty perches of land in the open field, and it succeeded very well, but this transplanting retards the growth of the plants, for they will be nearly as forward, if they are sown in the open field in May; and what I ventured to sow there sooner, did not succeed well. As the greatest part of our farmers are, unfortunately too poor, to undertake the culture of any plant, which will not produce them profit under eighteen months, I am about to try every method I can think of to make Madder grow in the same furrow with kidney beans. I cannot as yet tell what success this will have, but if it should be such as I hope, all obstacles will be removed, as the crop of beans will repay the expences of culture, and in the spring following there will be occasion only for one hoeing, as the Madder will be fit to take up in the month of September.

I intend at a proper time to give an account of the result of my experience, and I only now mention this scheme, to invite all lovers of husbandry to endeavour at finding out every method of propagating Madder.

Every one of these methods may be better adapted to one soil, than to another, but I must here observe, that hitherto, in the dry light lands, such as those about Oissel, the seed sown in May, or the well rooted plant, have succeeded best with me in the spring, and the suckers in the autumn.

As it is frequently proper to make even our miscarriages turn out to our benefit, it being out of my power to dry the roots I had taken up in October, without the help of fire, I caused them to be used green, and without drying.

In the first place I washed them clean, that no earthy particles might remain on them, and as I had experienced, agreeable to what M. du Hamel says on this subject, that Madder loses seven eighths of
its

its weight, when it is dried sufficiently to be ground into powder, I thought it would not be amiss, if I proportioned my quantity accordingly.

With this view, in a bath which would have required one pound of ground Madder, I infused eight pounds of the green root being first pounded in a mortar, and having dyed some cotton with it in the ordinary way, I found that the bath was still full charged with colour, and that the cotton was so deeply dyed, that it required two boilings to bring it to the common shade or tint.

I continued to make the experiment with six, and four pounds of the green root, and with the last mentioned quantity, I obtained a colour like that which is got from one pound of the dried root in powder.

As this is the case, half the quantity of the root is saved by using it green; yet this, tho' well worth our attention, is not the only saving.

I. The expence of erecting stoves and sheds to dry the roots in uncertain weather is entirely saved.

II. There is no danger of loss ensuing from the roots being dried too quick or too slow, either of which is prejudicial to its colour.

III. The waste occasioned by cleaning the roots, when all those of the size of the tag of a lace are lost among the rubbish, is avoided.

IV. Lastly, there is no danger to be apprehended of the roots fermenting, which the ground root constantly does, if it is not immediately made use of.

All these advantages, put together, may amount to a saving of five-eighths in point of quantity.

If the planter understands dying himself, he may begin to reap some advantage from his labour as soon as ever his roots are large enough for the purpose.

Those who are Dyers by trade, will, for their own sakes, soon adopt this practice when more
Madder

Madder comes to be planted ; nay, this practice may, in all probability, occasion the culture of this useful plant to be more attended to ; because, as the root may be taken up at any time, after it has been planted or sown eighteen months, when the farmer brings a quantity of the green roots to market, he will be sure of selling them in that state, without being subject to that trouble of dying them, which, though it is not much, yet does it appear formidable on account of its novelty.

The Dyer may every day buy a quantity in proportion to his consumption, or he may let the planter know when he will have occasion for any, and for how much.

I have besides experienced, that the roots may be preserved for the space of four months in a hole three feet deep, by placing a layer of roots and a layer of earth alternately.

I am not a little pleased with the result of this experiment, as it also tends to lessening the expence of dying, by which we may, perhaps, soon be enabled to sell our dyed goods at a lower price at foreign markets. Besides, this is a new thought, as neither M. Hellot, nor M. du Hamel, have given the least hint of it.

I have also experienced, that the Elbeuf Madder root is very good when used green, which is of no small importance to know, when we consider, how easily this sort is encreased, as it bears transplanting better than any other.

The principle difficulty, which I have now to get over, is to find out some method by which the roots may be taken up at a small expence, and which shall not leave those behind which strike downwards, as they yield the best colour ; for I found it very expensive when I had them carefully dug up. M. du Hamel recommends plowing them up, but, from what I have seen, this method will not answer, except

cept where a clayey bottom prevents the vermicular roots from striking downwards.

I have wrote to Holland to be informed of their method of proceeding in that country; but the Dutch are too good patriots, not to be very close in every thing that regards this plant, which we have permitted them entirely to monopolize. All the answer they made me was, that they used the spade and fork: I must therefore rest contented, and wait for what time and circumstances may inform me, and I shall not fail communicating that method which succeeds best with me.

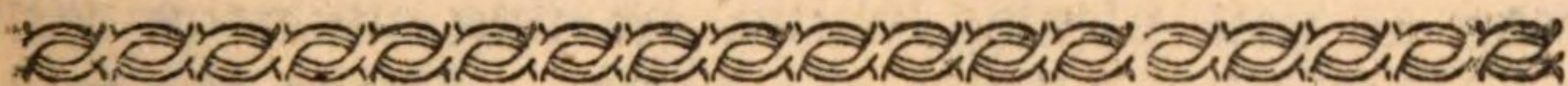
One objection may possibly be made against encouraging the culture of this plant in France, which is, that it may occasion the farmers to neglect their wheat, and this last is essentially necessary; but as an answer to this, besides our having such quantities of waste land, which may be applied to this use, I may, with M. de Hamel, observe, that, in the best lands of this country, the farmer may enjoy all the advantages of growing Madder, without growing less wheat than he did before. In fact, it need only occupy the land eighteen months, and, as soon as it is taken up, wheat may be sown on a single plowing, and there will be a good crop, without the assistance of any manure or dressing whatever. It is the custom, in our corn lands, to have only one crop of wheat in three years; and the same might be had if Madder was planted.

I am informed that the English make some advantage of their lands in Madder the first year, by sowing onions and pulse, such as do not strike their roots deep, or cast much shade; but it would be much more advantageous to cultivate Madder, in conjunction with kidney-beans, as if the rows were made regular, nothing need prevent the ground being stirred, which contributes so much to the progress of vegetation.

As

As soon as I have so great a plenty of seed and suckers as to be able to risk the loss of any in trying to lessen the expences of this culture, I shall willingly make many experiments to that end. It would give me singular pleasure to see some better observations on this culture from more able hands; but I shall, nevertheless, esteem it a great happiness, if these, which I now offer, should excite any degree of emulation, and contribute to lessen that tax, of near 2,000,000 of livres, which we yearly pay the Dutch for that commodity.

Madder is useful in almost every dye, and particularly in dying linens, in which vast quantities are consumed. We can cultivate it at home better in quality, and afford to sell it at a lower price. The rents of our lands are more reasonable, we enjoy a more temperate climate, and we are not, like the Dutch, obliged to contend with the elements.



ARTICLE VI.

A farther account of the culture of Madder in large, written since the last article, together with some cursory remarks on the culture of Madder by Seed alone. By M. D'AMBOURNEY.

IT will be to very little purpose for the favourers of Agriculture, to amuse themselves by planting Madder in their kitchen gardens, or on some piece of ground near their houses; our trade will not be at all benefited by it, till the farmers in general adopt the culture of this plant.

With this view I applied myself particularly to render this culture as simple as possible, and the success of my experiments, during the course of

this year 1762, convinces me, that there will soon remain no other obstacles to it but such as are not to be removed by industry and attention, as the white worms, extraordinary droughts, and other misfortunes, to which every crop is equally subject.

I confined myself, in my experiments, to the three sorts which yield the most lively and lasting colour, namely, the native Madder of Oissel, that of Poitou, and the Lizary or Hazala of Smyrna. All the three sorts produce seed from the first year, and in the second year, above 2000 seeds may be gathered from a plant which would not yield above from 20 to 30 cuttings and suckers. The difference betwixt these methods of culture is striking, and should, in every country where the seed of Madder will ripen, and this it will do in almost all France, induce the cultivators of this plant to prefer sowing it to any other method.

A trench, two feet deep, five feet wide, and as long as you please, should be dug under a wall which shelters it from the north. About the middle of February some fresh horse dung should be put into this trench: when this is well trodden down, and is within three inches of the surface of the earth, the trench is then to be filled with good mould, which is to be flatted down a little, and raked level. This sort of bed is to be preferred, because it requires no kind of skill to make it, whereas, to make a raised hot-bed, it is often necessary to employ a gardener. The expence of this bed is not to be mentioned, because it may be sown six times in the space of a year, and after that the fine mould, it produces, will be worth at least as much as the horse-dung which was at first used.

This need not prevent seed being sown in the kitchen garden; but as this last work should not be done till the middle of March, for fear of the frosts, there is still a great advantage from sowing on a hot-bed,

bed, as a month gained at this season cannot be too much valued.

On the 20th of February last I sowed on a hot-bed, such as I have described, about half a peck of Madder seed in little rills, about an inch deep, and three inches asunder. This is a much better method than random sowing, because the seed is more compleatly covered, and the weeds are with greater ease destroyed.

In about nineteen or twenty days the young plants appeared, they were watered and weeded as often as occasion required, and by the 30th of April they were in a condition proper to be transplanted into the open ground.

I attempted last year to sow Madder at the same time, and in the same furrows, with kidney-beans; but as these last appear above ground in about a week, they required earthing up by the time the Madder began to peep through the surface, and this operation entirely choaked it.

This year I imagined it would be best, instead of sowing the seed, to substitute the young plants from my hot-bed; therefore, in a moist season (this circumstance is absolutely necessary) I caused a piece of ground to be taken in hand, containing about 30 perches, on which the manure and tillage usually given for dwarf beans had been bestowed.

In every furrow, wherein the beans were sowed, I caused young Madder plants to be placed, by women and children, six or seven inches one from the other, the roots being placed at the bottom of the furrow, each supported by a handful of earth, and leaning against the side, the upper leaves were above the surface of the earth. The Ploughman waited a little at the end of the land till the furrow was stocked with plants, when he opened a second, in which neither seed nor plants were put, and turned the earth into the first. A woman finished

this work with a rake, as well to cover the beans compleatly, as to close the earth to the young plants-

The third furrow was then sown, and planted in like manner, till the whole piece was finished, and the young plants appeared in rows about fifteen inches asunder.

This work which was executed according to the customary method of sowing kidney beans (except that only two thirds of the usual quantity of seed was allowed) was compleated in five hours, by one plowman, three women, and three children. The piece was planted with twelve thousand Madder plants, which took root, and made shoots by the time the beans were come up. They were according to the usual custom, without any sort of danger, twice hoed and afterwards earthed up. They were seen to thrive well together: when the beans were ripe, they were pulled up, and the Madder which now possesses the entire ground, covers it as compleatly, as if it had been sown with any artificial grass. Most of it yielded a small quantity of seed.

The crop of beans notwithstanding the dryness of the season, will nearly pay the expences, and next year there will be the seed, and the roots of the Madder, in return for once hoeing and weeding it in the spring.

My hot bed was scarcely cleared, before I again sowed it with Madder, which on account of the extraordinary drought, I was obliged to leave till the sixth of August; this lost me one sowing. I then took the advantage of a rainy day, to transplant it. The same method was observed, excepting that the season being too far advanced, no beans could be sown with it. The length of the roots also occasioned more trouble in fixing the plants in the furrow, or they would have been spoiled, as in opening the second furrow, one of the horses was obliged to
take

take his path up the first. Notwithstanding this trouble the same number of people laid down sixteen thousand plants in six hours ; the piece is well furnished, and the plants will be strong enough to stand the winter.

On the fifteenth of May being deceived by the appearance of a small rain, I ventured to sow half an acre of land in alternate furrows like beans, but with Madder seed alone. I used about three pottles of seed, the loss of which, I much regretted, for the constant drowth so hardened the surface of the land, that the young plants could not penetrate through it, and all was ruined. A method which I shall presently mention, will on future occasions prevent this misfortune happening.

The sixth of August, I was inclined to sow my bed a third time, intending to let the young plants stand through the winter on it, and not plant them out till the latter end of the following month of February ; but the nineteen or twenty days, which the seed takes to come up a little disconcerted me. In this parching season it was necessary to water the plants frequently, which not only was fatiguing to the Gardener, but also laid part of the seed bare, and prevented its coming up.

I thought to remedy this by sowing some sprouted seed. Accordingly I laid some mould the thickness of three lines in the bottom of a box, this I entirely covered with seed, and so in alternate layers, till the box was full, the last layer of course being mould. I kept this continually watered, though it was exposed to the sun, examining every day what progress the seed had made. The eighth day the shoot began to appear, and the day after it was nine lines long. I seized this opportunity of sowing in the rills of my bed, the seed together with the earth, in which it had germinated. I raked it gently over,
and

and two days afterwards the rows were to be distinguished.

This method even saved me once weeding, for this was generally necessary, as soon as the feed, which was not thus managed, was come up.

The growth of the young plants was so rapid, that instead of letting them remain all the winter on the bed, as I had intended, I ventured to stock a rood of land with them on the fourteenth of September last. This last plantation is indeed in danger from the frost, but the event will serve as a lesson for my future conduct.

Eight days before this was done, I laid some more seed to sprout, I sowed my bed again with it, and it came up so well, that I mean to let it abide the winter there.

I am in hopes, with the assistance of this method of managing the feed, to raise, during the next summer, six several crops on my hot bed. I sowed at the same time some of this sprouted seed in a bed in my kitchen garden, and it came up in four days time.

I intend at the end of next April to venture to sow some in this manner, on a piece with kidney-beans; and I presume, that this feed already sprouted, coming up four days before them will be in a condition to bear, without injury, the first hoeing which the beans require; in this case, the expence of culture will be much less, than when the young Madder plants are removed to the piece sown with beans, and the hazard and delay of their taking root will be avoided.

If this experiment should succeed, it will be a great inducement to the farmers to adopt the method, as there will be occasion for only one plowman, a woman to sow the kidney-beans, another to sow the sprouted Madder seed in the same furrow, and a third to cover the whole with a rake.

The

The saving of the seed is expensive, when there is but little of it; because for fear of losing any, it is gathered almost grain by grain. I thought myself this year rich enough to make use of a more expeditious method.

I caused all such heads as had only a few green seeds at the ends, to be cut with a reaping hook, and laid on cloths in the sun. In two or three days the stalks and leaves were become so brittle, that a few strokes with a rod reduced them to powder. This was got rid of by twice fanning the seed, and the same may be said of the green seeds, which after they were dried became much lighter, than those which were black, or violet-coloured, and had their horny substance within fully formed.

I hope next year to save my seed with still less expence, by causing all the stalks and branches to be mowed at once, and to separate the seed from them, in the manner above described. The time for gathering this seed, is generally during the whole month of September.

The seed being thus separated from the stalks, should be again exposed to the sun, till it becomes quite dry, and will rattle in handling; for, if the least moisture remains in the black pulp which covers it, a fermentation in the winter will be the consequence, or at least it would grow mouldy, and the germ would be destroyed.

The seed must then be put into thin sacks, which should be hung to the ceiling of a dry and airy room, as well to keep it from dampness, as the ravages of mice, which are very fond of it.

If wheat is to be sown after the Madder, the roots must be taken up in the beginning of October of the second year.

No better method of doing this work, is at yet known, than to dig a trench two or three feet deep, at one end of the piece, into which the labourers, with

with pronged forks, are to turn the earth and roots, which last women and children pick up as they rise.

When this is done, the land is to be plowed for sowing wheat without any dressing, and with the saving of a third, or at least a fourth part of the seed.

The Madder roots, being taken up, might be chargeable to the planter, if the consumer should endeavour to take any advantage of their being soon subject to decay. At this season of the year he would be under a necessity, either of drying them in a kiln, or selling them for any low price than might be offered him.

These inconveniences appeared to me to be the greatest obstacles to adopting this culture more generally in France, since it was necessary, either to erect kilns, or leave the roots in the ground, till a purchaser could be met with. On this account, I caused a hole three feet deep to be dug in my garden; in which, on October 6, 1761, I threw thirty Madder plants, and the hole being filled up, remained in this manner exposed to the air and rain. I caused it to be opened the 30th day of March last, when I found all the roots in good condition.

The hole was then again filled up, and remained so, till the thirtieth of September, when even the vermicular roots, though broken and separated from the plants, appeared to me to be as firm and healthy, as when they were first deposited there; but being curious to know whether they had not undergone some alteration not discoverable by the eye, I dyed with them, at the same time with some other roots I had taken up for the purpose, and I found no difference in the bath, nor in the solidity, or brightness of the colour.

The planter then may preserve, in cases of necessity, his crop for a whole year, in a trench dug in
his

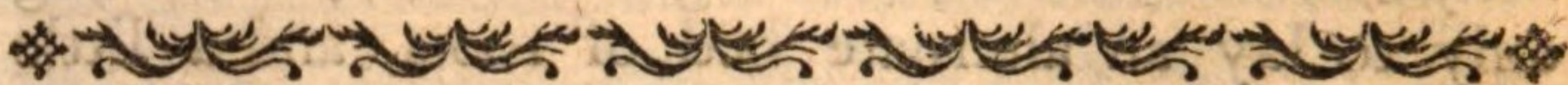
his yard, or even in the edge of a field, observing only to lay an alternate bed of roots, and a little earth.

In this manner he may wait for a proper opportunity, of selling them, and the consumer can no longer play the tyrant, by giving him what price he pleases, because he is obliged to sell.

The dyer, who is friend enough to himself, to adopt my method of dying with the green roots, may in like manner, preserve them in a hole, in his cellar, whence he may take them as his occasions require.

I think it proper to repeat in this place, that the method of using Madder roots green, may be reduced to the following heads. They must be washed a little to clear them of the earth which naturally cleaves to their outer coat, and for every pound of dried Madder, which would be used, there must be four of the green root. The roots are to be chopped moderately small and afterwards bruised in stone or wooden mortars, (by no means in iron) till they are reduced to a sort of pulp. This pulp must be put into the boiler when the water (to which no addition must afterwards be made) is somewhat more than lukewarm. It is then left till it is so hot, as scarcely to bear the hand in it. The stuff, or cotton, is then to be plunged in, and kept moving for three quarters of an hour, the bath being simmering all the time; lastly it is made to boil for three quarters of an hour.

As the bath remains when the work is done, charged with a much finer colour than when Dutch ground Madder is used, I intend this winter to try some experiments in order to discover what use may be made of it, and I shall at a proper time give an account of the success I meet with.



ARTICLE VII.

Extract of a Letter from M. MICHEL, Secretary to the Society of Agriculture established at Beauvais, to M. D'AMBOURNEY, dated December 2, 1762.

“THE society of Agriculture, established at Beauvais, having by accident got the copy of a manuscript essay on the culture of Madder, intended, without loss of time, to publish it.

“We knew not then that we were indebted to you for a treasure, which you so readily parted with, in discovering the method of using the roots of Madder green, and without drying.

“When we shewed your essay to our Dyers, they were with some difficulty brought to give credit to a thing so contrary to their daily experience.

“Out of mere complaisance, on the 9th day of last month, they consented to make a trial of dying two pieces of thin flannel with the roots of some Madder, newly taken up out of a Surgeon's garden on the town rampart. Mess. Guerin, who made the experiment, found, as you observed, that in using the green root there is a saving of five parts in eight.

“The two pieces, dyed with the Madder grown here, without comparison, surpassed in liveliness of colour other pieces which were dyed with Zealand Madder. Samples of the pieces dyed in this new manner have been sent to the council of state.”

ARTICLE



ARTICLE. VIII.

*An Essay on the Culture of Weld or Dyer's Weed,
now very little cultivated in England, written by
M. D'AMBOURNEY.*

THE Dyer's Weed, often called Weld, is of great use in giving a yellow colour to wool, silk, cotton, and flaxen yarn; for this reason it has the name of *Luteola Herba*, *Salicis Folio*. It is an annual; its roots do not strike deep into the ground; it puts forth long narrow leaves, of a bright green colour, lying circularly round the stem on the ground. The stem rises from the middle of the plant to the height of three or four feet, it is often branched, and is furnished with leaves like those at bottom, only they grow shorter as they approach nearer to the spike of flowers at the top: each flower is composed of three small irregular petals of a greenish yellow colour. These flowers are followed by a fruit of the same colour, rounded, terminating in three points, and enclosing several small roundish brown seeds.

All the parts of the plant, and particularly the seeds, are used in dying. Such Weld as is small, and of a russet colour, is held in the greatest esteem; that which is larger, and of a dull green, is not so much valued. This plant grows naturally in all parts of France, and particularly five or six leagues from Paris towards Pontoise.

The cultivated Weld is much superior to that which grows wild. A great deal of it is sown in the vale of Lery, and at Oissel, a village not far from Rouen, and a considerable quantity of it is

exported to Holland, besides what is consumed in France.

I shall now describe the manner in which it is cultivated at Oissel.

In the month of July, when the white kidney-beans are in blossom, after giving them the second hoeing, they are earthed up, and taking the advantage of a damp day, they sow the seed of the Weld, as regularly as possible, about half a peck on an acre. If the farmer is careful, he immediately draws between the rows of beans a spray faggot, to supply the place of a harrow, in covering the seed. By the time it is come up, the beans ripen and are gathered.

Towards Michaelmas the weld must be hoed and weeded, and in this state may be left during the winter. In March following, when the hard frosts are passed, if the weeds come up, it must be again hoed.

Towards the end of June, the second year, when the blossom is gone off, the seed formed, and the plant begins to turn yellow, it is pulled the day after a little rain has fallen. Four men will then pull somewhat more than a rood in a day; but, if on the contrary, the weather is dry, and the ground hard, they will scarcely do half so much.

The weld is carried off the land in large bundles, but as soon as it is got under cover, it must be unbound, and the plants must be set up against the walls, or against hedges, where the sun has great power, and in the space of two days they will be sufficiently dry.

The next thing to be done is to make it up in tight bundles, of about thirteen pounds each; and this work should be executed on a threshing cloth, that none of the seed may be lost: these bundles are stacked up, where they sweat and ripen, generally losing half a pound of their weight. The bundles

dles about twenty years ago sold for fifty sous a piece, but now they will not fetch a fourth part of the money.

A rood of good land where the Weld thrives well, generally yields sixty of these bundles, each weighing thirteen pounds; but the plant is apt to be too luxuriant, and branch too much: that which grows in light lands is most esteemed, rising with only a single stem, but then the farmer has only from thirty-five to forty bundles on a rood.

As soon as the Weld is pulled, the sheep are turned into the field to eat up the weeds; a plowing is then bestowed on it, and about the end of October it is sown, either with wheat or rye, without any manure being laid on it.

If the soil is light, and intended for spring corn, when it is plowed after pulling the Weld, turnips may be sown, which will be off the land before there will be any occasion to plow it for barley; in this case, it may not be amiss to refresh the land with a slight dressing of horn shavings, or some such manure.

When Weld is sown after peas, the land is plowed, and the seed in the proportion above-mentioned sprinkled on it. It must be sown like turnip seed, being taken up betwixt the thumb and middle finger, the fore finger serving to scatter the seed as it falls.

Three furrows only should be sown at a cast; and when the whole piece has been sown in this manner, the seedsman must go over it again, beginning at the other side, sowing twice in a place. It must then be harrowed in, and hoed at Michaelmas and in March, as is above noted.

Weld sown after peas does not impoverish the land, and in the month of October wheat may be sown in the same manner, as after the kidney-beans.

This

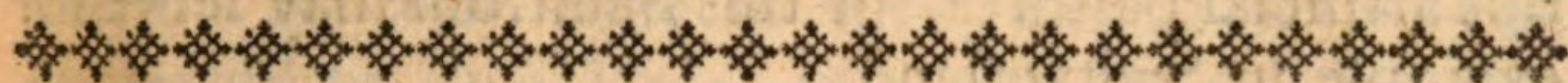
This plant is not only useful for dying yellow, but it also makes the sea green, pea green, pale green, and bright green, by passing the stuffs through the oil vat; it serves also as a ground for many other colours, and is even used in dying fine blacks.

Many other plants grow wild in Normandy, from which the dyers get a yellow, which though inferior to that of Weld, are no ways contemptible; amongst others, common heath, which is of great use in woolens, that are to be afterwards dyed green. The fruit of the great Buckthorn, gathered green, and dried in the shade, may be used instead of the Graine d'Avignon, but like that, it must only be used for dying leather yellow, the colour not being fixed enough for stuffs.

M. Hellot a member of the academy of sciences, recommends for culture, a plant called *virga aurea canadensis*; from the flowers of which he says he has obtained a good yellow, in all its shades. I shall try this experiment,

The bark of the ash stripped when the sap first begins to rise, also the barks of the peach tree, and pear-tree have all afforded M. Hellot a good yellow. It is much to be wished we had as many resources for other principal colours as for yellow, and a great acquisition it would be to find any sort of leaf that would yield a pure, and lasting green.

ARTICLE



ARTICLE IX.

An Essay on the Culture of Saintfoin, with some curious observations and experiments respecting the nature and properties of Marle, by M. LE CHAMBRIER DE TRAVANET, Treasurer-general of the principality of Neufchatel, and honorary Member of the Berne Society.

MANY objects are included in rural oeconomy, and the increase and improvement of our fodders is doubtless one of the most interesting. Without plenty of fodder, we cannot have numerous and well conditioned cattle, our manure would fall short, the corn lands would suffer, and trade would be hurt. The southern countries, much more fertile than ours, depend greatly on their several sorts of fodder: oats are sown there very thick, in order to their being mown green; they have recourse to lucern, vetches, &c.

In Switzerland they have made trials of clovers, lucern, and Saintfoin, and experience induces them to give the preference to the latter. In some places Saintfoin has prospered so well, that the price of fodder was considerably lowered by it.

These advantages have induced me to communicate to my countrymen several methods of cultivating this kind of fodder.

I must take the liberty, however, of making two previous remarks, though they may seem rather to make against the subject of this essay.

In the first place, it is now reckoned good oeconomy to cultivate the artificial grasses. The French, the English, the learned in the north, all write on
this

this subject ; in a short time there will be nothing but artificial pastures, of this Saintfoin may serve for example in Switzerland.

This plant flatters the master's eye by yielding a large quantity of fodder. The farmer reckons on the number of cart loads of hay which his field produces him, yet, if two loads of the same dimensions are weighed, one of good natural upland hay, and the other of Saintfoin hay, the first will be found to have greatly the advantage. If to this we add, that a part of the Saintfoin must be left for feed, the hay of which part is very harsh and wears out the teeth of the cattle, we shall doubtless find that two loads of good natural hay will go as far as three of Saintfoin.

It should also be considered, that the first year's crop is almost entirely lost ; that the charges of laying down a field in Saintfoin, what with the several necessary plowings, the buying of the seed, and the marling the land, which is very expensive, make it past a doubt, that to change a natural into an artificial pasture is not always so advantageous as at first it may appear to be.

With respect to lands in tillage, which are sown with Saintfoin, in order to calculate the advantages resulting from this practice, it will be necessary to deduct the produce of them in corn, and allow for the difference in the number of cattle kept for the plough.

The result then of this observation is, that wherever grass-lands can be watered or manured, and where-ever the soil is in heart enough to yield even a moderate crop of natural hay, no advantage will result from sowing Saintfoin. Lay on such lands a small proportion of Marl, and they will soon be full of wild clover.

II. I must observe, that much good land is now laid down to Saintfoin, which is certainly wrong,
as

as it tends to lessen the quantity of wheat that is raised. If, from time to time, some Marl was to be spread on such lands, provided the soil was not too stiff or wet, it would supply the place of dung, and fine crops of corn would ensue.

Good Saintfoin-feed may be known by the pod, which should be of a deep brown colour, large, and armed on one side with small prickles. Open some of these; if the seed is black and wrinkled, it is a sign it has been heated in the mow; if it is white and wrinkled, it is a certain sign it was not sufficiently ripe when it was cut. The first of these will not come up at all, and the second will sometimes produce a plant; but it soon turns yellow, and dies. The seed, to be good, should be speckled and bright; and if it is besides of a yellowish red colour, it is all that can be required.

Saintfoin-feed should be very clean dressed before it is laid up in a granary, that it may be perfectly clear from all seeds of weeds. It should be deposited in a very dry place, and well secured from mice, which are very fond of it.

Some say there are two sorts of Saintfoin, one with a pale-red flower, and the other with a flower of a deeper red colour. They say the first does not branch so much, nor last so long as the second.

I rather imagine the first to be a Saintfoin degenerated, by being sown in a bad soil. C. Bauchin, in his Pinax, and other Botanists whom I have consulted, admit not of this distinction. They define it only *Flore Purpureo* (by its purple flower); at all events the last sort is to be preferred.

Soils vary so much in their nature and qualities, that there is a gradation, or we may say there are almost imperceptable shades from the lightest to the closest, and to clays.

'Till some able naturalist shall enquire into this matter, as far at least as it relates to rural oeconomy,

we must be content to make only vague and general distinctions.

Light, deep, and dry soils agree well with Saintfoin. It succeeds also well on high grounds, provided they are marled.

The quantity of vigorous and long lived plants, produced by strong lands, is an evidence of their fertility; and these we always find when the land is on a slope, so that the rain, and the water from the land-springs, may be carried speedily off.

These soils will bear good Saintfoin, but then the cohesion of their parts must be corrected, and the roots of all the perennial plants growing on them must be totally and effectually destroyed. This may be done by deep plowings and cross plowings, frequently repeated, for several successive years, keeping the land constantly in tillage, and manuring it properly.

Frequent plowing is absolutely necessary, because, if this is omitted, the rains form a crust on the land, which is impenetrable to the influences of the atmosphere, the sun, and even the small rains. This crust is an enemy to the transpiration and internal fermentation, which are the efficient causes of the fertility of land. That seeming barrenness, which is attributed to some land, should rather be ascribed to the laziness or inability of the farmer, than to any deficiency in the soil. I am, however, in some doubt, whether it is proper to lay Marle on compact, clayey soils. It is true, some benefit will at first result from this practice by the crops being encreased; but when the salts are exhausted, and there remains only the caput mortuum, this will occasion that soil to be still more compact, which was before too much so. In this sense, we are to understand those who say, that Marle enriches the father, but impoverishes the son.

Nevertheless,

Nevertheless, if we could find a sandy Marle, it might be of service to clayey soils, because, being dissolved, and even its virtues exhausted, the sand would still remain, and serve to make the land lighter and more tractable.

Observe, that Marles are seldom without some extraneous mixture; some are mixed with sand, others with clay, and seldom any distinction is made between them. However, they may be easily known by washing them in water.

Saintfoin does not succeed in all places alike; wet soils by no means agree with it, unless they can be perfectly well drained. Its root naturally strikes deep into the land, and for this reason it makes but slight returns, and lasts but a short time on shallow soils. If the snow lays long on land, particularly if it has not a considerable slope, it by no means is suitable to Saintfoin, and still less for planting an orchard.

Most farmers sow their Saintfoin with corn, under a notion that the weeds will be thereby choaked, and the young plants shaded. If this practice must still be followed, it should be sown with either wheat or oats, and by no means with barley, rye, any kind of pulse, or with any seed, in fact, which produces a plant with strong or numerous roots.

Others sow wheat in autumn, and scatter Saintfoin-seed over it in the spring of the year.

I am apprehensive, that they who sow wheat or oats with Saintfoin, lay too much stress on having a crop the first year, and by that means one more than they would otherwise have.

I am of opinion that Saintfoin should be sown in autumn by itself. Shade may, it is true, be necessary to it in the southern climates; but we have seldom in our country any weather so hot as to raise apprehensions in us on this head. When the Saintfoin-seed has no partners to rob it of its food, it

will doubtless unfold itself, and push forth its shoot with vigour; notwithstanding all the care that can be taken there will still be too many seeds of annual weeds, which either the wind or the dung will have brought upon the land, or which may have been preserved in the ground since the preceding year. This root being more at liberty in land that has been well tilled, and moreover enriched by the influences of the atmosphere and sun, the rains, dews, and the internal fermentation, will preserve a sufficient coolness and moisture, and will supply this plant with a greater quantity of nourishment, and make it more strong and vigorous.

According to the celebrated Du Hamel, the root is only strong and vigorous in proportion to the size of the plant.

The respiration and perspiration of the stem, the motion of the sap, the dilatation of the pores, being the effects of plentiful nourishment, are at the same time the causes of the plants living and increasing in size. In this manner, from the moment of the seed's unfolding itself, the plant acquires a vigour, which enables it to overcome all obstacles, as well those of the soil as of unfavourable seasons, which sometimes happen; this same vigour also enables the Saintfoin the following year, to choak all the weeds which may grow near it.

If it is in any sort convenient, it is much better to sow Saintfoin in the beginning of autumn, than in the spring. Having taken root in this season, it gets amazingly forward, when the fine weather comes on.

The best preparation of the land consists in frequently plowing it three, and even four plowings, if it is possible, should be bestowed; and, if it can be done, the land should be cross-plowed. When land lays on the slope, the second plowing should be diagonal, because

because the plough cannot meet the hill to cross the furrows.

Before the last plowing, as much manure should be laid on the land as is allowed for a crop of wheat, and the dung should be very rotten; in this all good farmers agree.

The last time the plough is put into the land, it should be followed by some children, who should pick up all the weeds and roots they can see.

The seed being spread, it should be covered two inches thick with earth; and to effect this, it will be necessary to pass over the land a large harrow with iron teeth, and if it is loaded, so much the better. To this harrow should be fastened a bush faggot, which lays the land smooth, and covers the seed.

The farmer must not think all this trouble too much, since as much is required, when either hemp or flax is sown. As Saintfoin will last long on the land, it is as valuable a crop.

In Languedoc, though their land is better than ours, and their climate more favourable, yet are they most scrupulously careful when they lay down a field in lucern.

In order to prevent my repeating the same thing twice over, I should in this place take notice of another method which has been communicated to me by M. Jeanneret the elder, who on all accounts is very capable of making trials of this sort. The essay he was so kind as to write for me, contains many new and interesting experiments. As it chiefly treats of a new method of using Marle, I shall add it, by way of suppliment, to this essay. This Gentleman being so good a judge in matters of Agriculture, will induce the reader to entertain a favourable opinion of it.

It is generally the custom to sow three times as much Saintfoin seed as would be sown of wheat on the

the same extent of land; this proportion is too large and too uncertain. I am of opinion, that the quality of the soil, and number of plowings that have been given, should regulate his matter. If the soil is good and well tilled, much less seed will do. If the farmer intends carefully to cover this seed, less will serve than when it is left on the surface of the land, for in this last case the birds and the mice come in for their shares. However, after all, it is better to sow too much than too little, for when it comes up very thick, it is more likely to choak the weeds.

When Saintfoin is intended to be made into hay, it should be mown as soon as it is in flower; for if it is left till the seeds come towards ripening, the stalks grow hard, and the root is hurt. Besides, by moving somewhat sooner, the second crop will be the larger.

No cattle should be turned upon Saintfoin, particularly whilst it is young; for in feeding they are apt to draw up the young plant, roots and all. Besides Saintfoin naturally makes a strait shoot, and treading does it great injury.

An intelligent farmer has remarked that if Saintfoin is suffered to bear seed for several successive years, its root becomes woody; but that if on the other hand it is constantly mown the root instead of pushing deep into the land, grows large, and not drawing nourishment from any depth, the crop falls off.

To avoid these two extremes he every year mows for hay, two thirds of his Saintfoin, leaving the other third to ripen its seed, and taking care every year to vary that part which is to bear seed. His crops are large which evidently prove his remarks to be just.

In order to make the most of the stalks, which are hard, as having borne seed, they may be chopped in a cutting box, in the same manner as straw
is

is cut for horses, or at least they may be bruised with a flail.

Several methods of separating the seed of Saintfoin, are in use, but it will be proper to particularize them, that every one may adopt that which he most approves of.

I. The Saintfoin being yet standing, and the seed ripe, women are sent into the field, who pull off the heads, and put them into their aprons; they are then carried to the barn floor, where they are either threshed with rods, or rubbed hard betwixt the hands to separate the seed. This method is attended with several inconveniences; it requires much more labour and expence, the Saintfoin stalks are trod down, and are afterwards with difficulty mown. Lastly the seed gathered in this manner, is more apt to heat, and does not keep good so long as that which is left in the capsules, wherein it perfects itself, and acquires a greater degree of maturity.

II. Others mow the Saintfoin, after the manner of barley, or oats; that is, they fix a cradle on the scythe, that it may lay the stalks regular: when it is dry, it is laid up like common hay, and after it has sweated or been heated in the mow the seed is separated from it.

I am well aware that some of the seed will shed in mowing, but this is not wholly lost, for it will grow, and by that means, in some sort replenish the Saintfoin lay. Besides this inconvenience is fully compensated, as the seed acquires a superior quality, by remaining in the capsule, which is still attached to the stalk; by being heated in the mow, it is still nourished by the sap remaining in the stalk, acquires a greater degree of maturity, and is afterwards more easily separated.

To separate the seed, some use large rods, which do the work very well, but if a farmer has a considerable quantity of Saintfoin, he makes use of the
common

common flails, observing only to lay the beds very thick on the barn floor, that the strokes of the flails may not bruise the pods which inclose the seed.

This method is least expensive, and produces more seed, because that which was not full ripe when it was mown, will perfect its maturity in the barn.

III. Other farmers spread one or two large threshing cloths on the field, when the Saintfoin having been mowed and separated into gavels like wheat, the workmen take these gavels one by one, and shake them over the cloth, or strike them against a fork laid over the cloth; the ripest seed falls out, which being put up into sacks dust and all, they are carried to some dry airy place; where it is spread without separating the dust from it, and when it is sufficiently dry, it is put into a dry room, and kept there till it is wanted.

When the crops of Saintfoin fall off, it will be proper to renew it. If it has not born seed for several years, it should be permitted to ripen its seed; that which is first ripe will fall, and a considerable part of it will immediately sprout and grow. These young plants will supply the places of those which are exhausted. In this manner the common grass fields renew themselves.

As the salts of this Saintfoin lay must be exhausted, it will be proper in autumn, to lay about fifty loads of marle on each acre; in the following spring, with the help of some iron-tined small harrows, this marle may be spread with regularity on the field, and that which is not mouldered, but partakes of the nature of stone, must be carried off, and laid in a heap to mellow; after which it may be spread on the field.

By a load of marle is here understood, as much as a yoke of good oxen can draw, without being overloaded. If marle is not to be got, some very rotten dung, or mould may be spread on the field.

If

If it is an old Saintfoin lay, these will be but palliative remedies, and last only for a time, because it is the general opinion that Saintfoin sown in this manner is never either so thick, or lasts so long as the first sowing.

In this last case it is best to turn up the field, and to destroy the old exhausted Saintfoin plants, as well as the grass and weeds, which now begin to get a-head. If the Saintfoin had been marled, the good effects of the marle will in some measure be renewed, as it will be again brought to the surface by the plough.

It will be proper to keep this field for some years under the plough, and till it in the manner already described. This will be no loss, for the field may be sown with corn or pulse; the salts proper to afford them nourishment, not being dissipated, the farmer will find every thing succeed to his wish.

When the field has been some years in tillage, it may be again sown with Saintfoin, which will not fail to thrive. In this manner, by varying the crops on the same land, considerable advantages arise.

The happy effects of marle, for the purposes of vegetation, should induce every one fond of philosophical researches to enquire into its principles, and every farmer to distinguish that which he ought to prefer.

In order to satisfy the reasonable curiosity of the first, and the prudent foresight of the latter; I have thought proper to conclude this essay, with some enquiries into the nature and properties of Marle.

With this view, an able artist made under my inspection several experiments, on some grey Marle approaching to the colour of slate, taken from two Marle-pits, near three leagues distant one from the other. They differ, in that one is fine grained, soft to the touch, and being exposed to the air, soon dissolves; the other is coarser grained, feels rough in

handling, is harder, and with more difficulty dissolved, on being exposed to the air, or being laid on land.

Three China basons were taken, in each of which were put two ounces of Marle grossly pulverized, because it was taken from a large piece of Marle.

On that in the first bason one hundred drops of spirit of nitre were first dropped, and when it began to ferment, cold water was poured on it. The ebullition was strong, the bason was filled with froth, and a great smoke issued from it. In the space of a few minutes the Marle was perfectly dissolved.

In the second bason the same operations were repeated with the spirit of vitriol, all in the same proportions, as in the first bason. The fermentation was nearly the same; but instead of being dissolved, the Marle was considerably increased in bulk.

Lastly, in a third bason, an ounce of distilled vinegar was poured; the ebullition on the cold water, being added, was the same; but the Marle instead of being dissolved, became granulated like small shot.

Two hours afterwards, ninety-five drops of spirit of nitre were again put into the first bason, as much spirit of vitriol into the second, and some distilled vinegar into the third; a new ebullition ensued, and the same effects were apparent, as from the first operation.

In three other basons, exactly the same experiments were made, with the same quantities, and the effects were the same. We may thence conclude, that, though these two sorts of Marle appeared different, to the eye, to the touch, and in using them, yet they may have the same effects in promoting vegetation; with this difference, however, that the effects of the hardest Marle is slower in proportion to the length of time it takes to dissolve.

The

The four ounces of Marle, which had been impregnated with spirit of nitre, in the two basons, were added together, a lixivium was made from them, which being evaporated by fire, yielded half an ounce of a nitrous salt, which crackled on the coals like nitre; and shot forth needles like it. This effect is no ways surprizing, spirit of nitre being only salt-petre, discharged of its earthly particles; so that when you add to it any earth whatever, provided it can be dissolved in it, it becomes salt-petre again.

Some experiment was yet to be made on the substance of the Marle. A hard piece, just taken from the pit, was pounded, washed, and a lixivium made from it. The lotions being filtered and inspissated yielded no kind of salt whatever.

The Marle being first dissolved by the air, and then managed in the same manner, yielded a bituminous salt, but in a small quantity.

RESULT of the several preceding EXPERIMENTS.

I. IT was evident, that Marle will not amalgamate, or mix either with spirit of vitriol or distilled vinegar, which are both strong acids; but on the contrary, they yielded a Magma, or a Coagulation. The Marle perfectly dissolved with spirit of nitre; whence it may be concluded, that, though it may not contain in itself any salt, it will, nevertheless, imbibe and attract the universal spirit or nitre, so conducive to the fertilization of land.

II. That Marle which will soonest and best dissolve with spirit of nitre is to be preferred, as it will attract more powerfully the universal spirit, dispersed in every part of the atmosphere.

III. Marle appears to be only a simple matrix, which like a sponge imbibes the nitre, and salts dispersed in the air; since when it was first taken from

the pit it yielded no salt ; yet that which was taken from the same pit, and dissolved in the air, yielded a small quantity of a bitumenous salt.

IV. If Marle, even in the quality of a simple matrix, is well adapted to attract the nitre in the air, its effect on vegetation will be lasting, as it may be reiteratedly impregnated. This is made evident, by the earth from which the salt-petre makers have extracted the salt-petre. Being exposed for a certain number of years to the air, and to the north easterly and north winds, and being sheltered by walls from the south, it imbibes salt-petre a-new, which is again by the former operations extracted.

V. From the preceding observations it should seem we might conclude, that Marle would be of no use on light gravelly lands, when turned in by the plough ; because, not being exposed to the open air, it cannot attract the nitre or universal spirit, and be impregnated with it. Experience, however, proves the good effects resulting from this practice, which should be attributed to the porous nature of the Marle ; it imbibes the water which penetrates the surface of the soil, and preserves it to refresh the roots of the plants. Without this help, the fructifying water would either have sunk deeper, or have been evaporated by the first heats.

VI. Marle has an effect so visible, so speedy, and even so lasting in promoting vegetation, that it is with some difficulty we can persuade ourselves it has no other quality but that of attracting to itself the universal spirit ; may we not presume that it contains salts or sulphur, which art has not yet been able to discover. Nature seems to cast a veil before our eyes, we see the effects, but the causes are hid from us.

Many of the constituent parts of minerals and metals escape our researches ; they are exhaled and dispersed by the fire of the laboratories, and, mixing
salts

salts and spirits with them, produces nearly the same effects, by means of fermentation; they are another species of fire.

Let us then be content to know what experience teaches us. Speculations on the nature of Marle are the less necessary, because farmers seldom have it in their power to choose. Every one is obliged to make use of that which is nearest to him; as, to bring this manure from any considerable distance, would greatly encrease the expence of marling the land, because the price of carriage would be in proportion increased.



ARTICLE X.

An Essay on the best method of Marling and managing poor Lands; intended as a Supplement to the preceding Piece, and written by M. JEANNERET the elder.

IN all the various soils which I have hitherto endeavoured to improve at my estate at Chatillon, my first desire was to make myself acquainted with their nature, and for this purpose I always made trials to find out whether they were sandy or a good mould, either black or light coloured, as by the result I regulated the quantity of Marle I was to lay on.

When I had made this trial, and found the soil to be light, sandy, and hungry, I concluded that it required of course a larger quantity of Marle, which in such a case I extended to 400 loads on an acre.

But before I lay on the Marle, I begin by breaking up the field I would improve in the month of May. To make this work the more easy, I turn up three furrows, the whole length of the piece,
and

and immediately carry the earth to the other side of the land, where the work is to be finished.

[The reader is desired to observe, that in this work the shifting-ear-plough is used. This implement is described by M. du Hamel in his Elements of Agriculture, and does not materially differ from that described by Lewis in his history of Thanet, which last is now used in many parts of Kent.]

After this is carried over, the ear of the plough turns with ease the earth which is cut by the share and coulter, and the turf is laid underneath. The same may be said of all the subsequent furrows, provided the ploughman is attentive always to take the same breath of earth, which I fix at a foot.

By this means one furrow is always replaced by another, and the earth, that was carried to the other side of the land, supplies the vacancy which there would otherwise have been.

When this work is done, I leave the land in quiet for a whole twelvemonth; and that I may lose no advantage, I cover it first with Marle, which, during the summer's heat, and the frosts of the winter, has full time to melt and dissolve. Another advantage also results from this method, which is, that the turf being perfectly covered, as well by the Marle, as by the cart wheels going backwards and forwards over every part of the land, it amounts almost to a second plowing, and the roots, of what kind soever they are, being broke and bruised by the cart wheels, insensibly die away.

In the following spring I again plow this land, and if it lies on the flat, instead of plowing it the same way I did at first, I cross-plow it, beginning at one end and finishing at the other, observing not to make the furrows as wide as before, but at most eight inches. In this manner the land is completely tilled, and the surface is laid even, which it would not otherwise be.

If

If the land lays on a slope, as this method cannot be put in practice, I content myself, after having again carried over the first furrow, with plowing it sloping, so that the second plowing shall not be in the same direction with the first.

When the land is thus twice plowed, I sow the field with oats, peas, or tares; but never with barley, rye, or wheat; and immediately after harvest, which usually happens the latter end of July or August, I again turn up the field, and this makes the third plowing.

In the month of September, I lay on the same field about fifteen loads of dung per acre, and immediately afterwards, plowing for the fourth time, I sow wheat alone, after having soaked the seed twelve hours in the juice of an old dunghill.

If the soil, which I have improved in this manner, is parching, sandy, and dry, I use three bushels of wheat; which, being soaked, swell and increase to four bushels. If the soil is well broke, and has been some time in tillage, I use only ten pecks on an acre: and, lastly, if it be a loose, light, good, black mould, I only allow two bushels.

The quantity of seed to be used, should entirely be regulated by the good or bad quality of the soil; for in good soils the wheat will branch more than it will in such as are indifferent; and, in these last, more than in those which are parching and sandy.

By observing these rules, it is very certain, that the farmer scarcely ever fails of succeeding, and makes the greatest advantage possible of a very indifferent soil. I say, this he does with the assistance of Marle; and I must remark, that if the Marle is not well broke and mixed with the soil, the effects will be partial, and only visible in spots. The reason for this is so palpable, that I need not mention it.

What is the intention of laying Marle on land that is light and wants substance? It is surely to give it a certain consistence, render it capable of retaining
the

the nitre of the atmospher, of preserving a proper degree of moisture, and to make it, from being barren, become fruitful. Therefore to attain this end, such soils must be well broke, and the Marle mixed with them, or the farmer will be disappointed in his expectations.

In order to make the most of land, managed in the manner above described, it should be plowed immediately after the wheat harvest, in the same manner as it was at first plowed; and in September wheat may be sown a second time, or in the following spring the bearded summer wheat may be sown: this I did with good success in 1760, notwithstanding the drowth of the summer in that year.

If, on the contrary, the farmer chuses to lay down his field with Santfoin, he may, in the month of March, sow oats and Saintfoin, allowing only four bushels of oats, and five of Saintfoin, on an acre. This quantity has always succeeded well with me, and, I have observed, that it is wrong to allow too much Saintfoin seed; because, as that plant branches much, the strong plants kill those that are weaker, which last never live above a couple of years. I write this from my own constant experience.

I have practised another method of sowing Saintfoin. When the wheat is five or six inches high, in the month March, I sow Saintfoin over it. I have, at this time, at Châtillon, twelve acres sown in the manner I have described, and it is as fine as ever was seen, yielding us last year above three loads per acre.

This then is the manner in which I treat the lands I mean to improve, regulating myself as to the quantity of the Marle, by the good or bad quality of the soil. The least quantity that should be laid on a good soil, is two hundred loads per acre, that is
to

to say, if it is to be sown, and the farmer would wish the effects to be lasting. If the farmer only desires to have fine Saintfoin, but which shall not last long, he need only plow his land in the ordinary way, sow it with Saintfoin and oats in the spring; and at the end of three years, lay about eighty loads of Marle on an acre; and this is the smallest quantity that should be used.

With respect to Saintfoin lays, as we have some which are eight, ten, and twelve years old, and which having for want of nourishment lost their vigour, send forth only a small stalks, my method of managing them is as follows. In the month of September, or in October, I cover them about an inch thick with Marle, which must be immediately spread, lest the plants under the heaps should be killed. In the spring following the Marle should be raked, in order to lay it as equally as possible over the land; but, if the Marle should happen to be sufficiently mouldered and crumbled before the winter, it will be best then to rake it.

That I may not omit any thing material, and in order to convince the farmers how mistaken they are in their present methods of managing Marle, I shall in this place make two observations.

In the first place, the sooner Marle is laid on land, be it of what nature it may, the better it dissolves and attracts to itself the nitrous particles in the air. Whenever I have it in my power, I make it my business to have the Marle carted on the land as fast as it is thrown out of the pit, and I cause the lumps of it to be broke, and the whole immediately spread.

In the second place, it has been said, that Marle is prejudicial, when laid on in too large quantities, that it ruins the son, after having enriched the father. Nothing can be more contrary to reason and truth than this; for I can affirm, that thirty-three years ago, whilst my father was living, I caused

some land of the nature of that at Châtillon (light and dry) to be marled. After some years, the Marle being subsided, yielded no good effects. About ten years ago we plowed up this field, and of course brought to the surface the Marle, which was before, in a manner, lost. It again attracted the nitre in the air, and was the means of producing as good crops as at first. This may be depended on as a certain fact.

In farther commendation of Marle; I must observe, that though the farmer may not have in view the sowing of either wheat, oats, or Saintfoin; yet he may reap great advantage from it, by simply laying it on land, though of ever so indifferent a nature; because it will infallibly produce clover, or rather it will revive this clover, which is generally a good bearing plant; and I can venture to assert, that this very year, clover came up as thick as possible, in a spot where a load of Marle was overturned, and where there was not before the least appearance of it, but where, I presume, there was either seed, or very minute plants.

I had like to have forgot one very essential observation with respect to Marle, which is that, when by length of time, by the effects of water, or the air, it is become white, and of the nature of clay; so far from being of service to vegetation, it will ruin any soil it is laid on, by its compact substance, and being totally deficient in sulphur and salt, which constitute the chief merit of Marles.

The white Marles are generally found at opening the pits, and the bed is thicker or thinner according to the situation, the fall the water had at the universal deluge, and the action of the sun, air, and water; but, be it as it may, they are to be rejected, and the lower beds of Marle preferred, particularly the slate-blue-coloured and marbled sorts, provided they are soft, smooth, and have a soapy feel.

ARTICLE

A R T I C L E. XI.

An Account of the culture of the Virginian plane tree, for its use, and beauty, recommended by M. MILLER, being an extract of a letter from M. de WALDNER, a Lieutenant Colonel, in the French Service. Dated October 8th 1762.

THE Virginian Plane tree, grows very high, its shoots are strong, and vigorous, its leaf which is very large, resembles much that of the great maple tree. M. d'Aubenton says that the plane tree, is of a genus quite different from the maple, that the wood of it is in quality betwixt the oak, and the beech; and that it may be usefully employed in building, making implements of husbandry, and in the smaller handy craft trades.

[As M. de Waldner gives no particular description of this tree, it may not be amiss, to see what Mr. Miller says on the subject. The characters of the plane tree are, that it hath male, and female flowers growing separate on the same tree. The male, and female flowers are collected in a round ball, they have no petals, and very small empalements; they have oblong coloured stamina, which are terminated by four cornered summits. The female flowers have small scaly empalements, and several small concave petals, with several awl-shaped germen sitting upon the styles, crowned by recurved stigmas; these are collected in large balls. The germen afterwards turns to a roundish seed, sitting upon the bristly style, and surrounded with downy hairs.

The *Platanus foliis lobatis* Hort. Cliff. 447, Plane tree with lobated leaves, or the *Platanus Occidentalis* aut *Virginienfis*, Park. Theat. 1427.

Occidental or Virginian Plane-tree, grows naturally in most parts of North America to a large size, the stem being very strait, and of equal girth most part of the length. The bark is smooth, and annually falls off. The branches extend wide on every side, the young ones have a brownish bark, but the old ones grey; the footstalks of the leaves are three inches long, the leaves are seven inches long and ten broad; they are cut into three lobes or angles, and have several acute indentures on their borders, with three longitudinal mid-ribs, and many strong lateral veins. The leaves are of a light green on their upper side, and paler on their under. The flowers grow in round balls, but smaller than those of the eastern Plane-tree. The leaves and flowers come out in June, and the seeds ripen in autumn.]

The plane-tree thrives well after being transplanted, and will grow in any soil that will agree with the lime-tree, requiring the same culture. M. du Hamel observes, that it thrives best in a moist soil, where it makes a most astonishing progress.

It should be transplanted in autumn, about the beginning of November, in light soils, dry, and somewhat elevated; but in moist, clayey soils, this work may be deferred till spring. To prevent any damage which might ensue from a dry season, it will be best to transplant this tree about the end of February; but the length of the winter and the climate should regulate this matter. If the soil is low, strong, and wet, this tree must of course be planted only in the spring.

I shall not enter into a detail about the manner of making the holes, and planting plane-trees in them, it is done in the usual method; I shall only observe, that no bank of earth must be thrown up round these trees, under a pretence of saving them from being blown down by the wind, but they must be secured by strait strong poles, which shall reach to the top of each tree. It will be also proper to bind
some

some twisted straw round the stem of the Plane-tree, in order to prevent it from drying, and the first year it should be plentifully watered twice a week, when the weather is dry.

Above all things, care must be taken to weed the ground at the foot of the tree, to keep it clear of grass, which is a great enemy to new plantations.

As the plane-tree is a quick grower, it will easily, on the slightest view, be perceived, that if the straw bandages are not from time to time renewed, they will choak the tree.

When the trees are very young, being only two, three, or four feet in height, such as those I have now the honour to send you, they should be put into a nursery, and cut down to two eyes above the ground. In the month of June following, the weakest of the two branches are to be taken off, and the other is to be tied to a strait stake. This precaution, however, was omitted in transplanting a part of the trees I now have, and they succeeded equally well.

The branches nearest the ground were laid down, and they took well.

Some cuttings which were planted last spring, and which were only pieces of branches two inches long, succeeded tolerably well; for about a third part of them grew, which was more than could reasonably be expected from such young wood. It is true, that the soil of the nursery where they are is very good, and that out of thirty plants, such as I send you, not one died. Since the latter end of March, 1761, they have grown so fast, that the shortest of them is near eight feet high, and the tallest ten and eleven feet. They have besides furnished thirty layers, which succeeded, and near twenty cuttings.

When your trees are six or seven feet high, you may transplant them to where they are to stand, if they are well rooted, without any trimming; but they

they must be supported by poles ten feet high. It sometimes happens, that in plants of this size, the sap will plentifully rise only half, or two-thirds of the height of the stem. When this is the case, they must be let alone till the end of June; the stem must then be cut down to a little above the most vigorous shoot, and the other shoots must be shortened to half their length; the principal shoot must afterwards be tied to the pole, and in this manner the tree may be made to grow to almost any height, according as there may be occasion.

No insect ever attacks the leaves of the plane-tree; but I am apprehensive that it is subject to be damaged by high winds, because it has a very large leaf, and the vigorous shoots it makes must be tender and brittle for the first year or two.

Notwithstanding this inconvenience, this tree must certainly be very proper to adorn publick walks, to plant by highway-sides, and in particular quarters of the pleasure-garden. It is preferable to most of our trees on account of the beauty of its stem and leaves, the quality of its wood, and particularly for the amazing quickness of its growth.

[Mr. Miller's account of the culture of the Virginian Plane-tree being curious, and not very long, the insertion of it in this place cannot be improper.

He says, that it will grow extremely well from cuttings, if they are planted in the beginning of October, upon a moist soil, and, if they are watered in dry weather, will make prodigious progress, so that in a few years from the planting, they will afford noble trees for planting of avenues, and other shady walks, and their trunks are perfectly strait, growing nearly of the same size, to a considerable height, there being the least difference in the girth of this tree, for several yards upwards, of any other sort of tree whatsoever.

The Hon. Paul Dudley, Esq; in a letter to the Royal Society, mentions one of these trees, which he observed in New England, whose girt was nine yards, and held its bigness a great way up, which tree, when cut down, made twenty-two cords of wood. He also says, in the same letter, that he had propagated many of these trees, by cutting off sticks of five or six feet long, and setting them a foot deep into the ground in the spring of the year, when the season was wet, and that they always thrive best in a moist soil.

They are propagated very easily by layers, every twig of them will take root, if they are but covered with earth; these layers will be well rooted in one year, when they should be cut off from the old trees or stools, and planted in a nursery, where they may remain two or three years to get strength, and then be transplanted where they are to remain; for the younger these trees are planted, the better they will thrive.

M. Miller made an experiment of this in 1731, when he planted one of these trees, whose stem was eight inches in girt; and near it, in the same soil and situation, he planted another, whose girt was not three inches; and the latter, at the time he published his Dictionary, was much larger than the former, and gained more in one year than the other did in three.]

ARTICLE XII.

An Essay on the advantages resulting from the cultivation of a sort of Wheat to be procured in Silesia; written by M. Dumesnil Coûté.

OF all the fruits of the earth Wheat is certainly of the most consequence, I therefore think myself obliged to inform the public of a discovery I have made of a sort of Wheat, the culture of which, it should seem, is proper to be recommended and encouraged.

We know by experience, that Wheats, like fruits, differ one from the other.

The particular advantage of the sort I would now recommend is, that it is not subject to the smut, and this I am convinced of, from the experience I have had of its culture.

This Wheat is less subject to lodge, the straw being full of pith, it yields to the blasts of wind, and rises again elastic like a reed.

The Germans reap great advantage from this wheat: they chop the straw, and feed their cattle with it in the winter.

The benefit to be derived from this wheat is still more considerable, in that it yields larger returns than the common wheat; it contains more flour, and makes very good bread; though, I must confess, it eats a little dry and husky.

This corn must be separated from the ear by striking handfuls of the sheaves against the belly of an empty cask, it being too tender to bear the strokes of the flail, but as it parts easily from the straw, a great deal may in this manner be separated in a day.

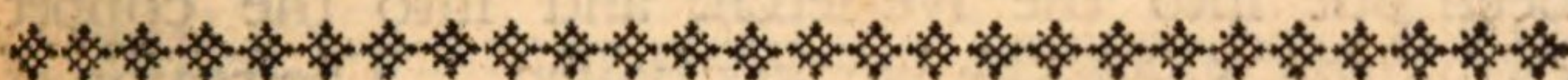
The method of cultivating it is as easy as can be wished; it must be sown early, in a rich soil well prepared; and rather more seed should be allowed than when common wheat is sown.



FOREIGN ESSAYS, &c.



N U M B E R II.



A R T I C L E XIII.

An Essay on the Preservation of Grain, containing a Method of keeping it, advantageous as well in respect to the Quality as Quantity. Written by M. MARCET DE MEZIERES, of Switzerland.

AS soon as the harvest is got in, I give the corn in the barn as much air as possible, to hasten the drying of the sheaves, which I find to be a matter of some importance.

About the middle of August I get my Wheat threshed out. It costs me indeed something extraordinary; but I have ample amends made me, as it threshes, dresses, and dries better; is no longer subject to the depredations of the rats and mice, to the thefts of servants and labourers, to receiving damage by damps or hard rains, or to shedding in the barn, great part of which sheddings is generally lost.

When the Farmer, with the view of saving a trifle, puts off the threshing of his Wheat till the winter, most of these losses are felt.

M

After

After the first day, I cause all they have threshed to be brought into a large room, the windows of which to the east and south are opened, and the floor being made very clean, is covered two inches thick with the corn.

As soon as it is dry enough, which may be known by its rattling when you pour it out of one hand into the other, I have it screened, which separates from it all the under corn, seeds of weeds, and dust.

I have ready some sacks, made very narrow, of coarse cloth, which have been dipped in a strong lixivium, several handfuls of green oziers having been put into the lye-letch, and into the copper chauldron where the lye was boiled. The reason of doing this will presently appear.

The sacks being well filled and fast tied, hold about three bushels (English) each. When all my sacks are filled, two treffels, about three feet high, with the backs rounded, and about eight inches wide, are set one beside the other.

Upon these treffels six sacks are laid at six inches distance one from the other, on the intervals five more are laid, then four, three, two, and one; so that the whole number seems to form a perforated pyramid.

Other treffels of the same kind are used for what sacks remain to be piled.

When this work is completed, and the sacks are all placed in proper order, I cause the shutters and casements to be closed, and the double curtains of the windows to be drawn. The double doors are also shut, and I keep the keys in my bureau.

I never touch this store, but for the use of the family, and for sale; and it is very easy for me to distinguish which part is to be applied to these several uses, as I always have the precaution to pile them on different treffels.

Experience

Experience having convinced me that every body, whether liquid or solid, which contains in itself any principle of fermentation, is most inclined to have that principle set in motion, when it is long left in one situation without being moved, I never fail, towards the latter end of the month of March following, of having all the corn in my sacks again screened; observing when they are filled to make them the same weight they were before; when they are once more laid on the treffels in the former order.

About the end of June, I think it enough to empty the sacks one into another, and replace them.

When I want my room for the new corn, I cause that of the last harvest to be carried to my town-house, where it is placed in the same order as it was in the country.

In the month of October, the corn, which was carried to town, is all screened and sifted in a wire seive, after which it is in order to go to the mill.

This corn is intended for the consumption of the following year; so that the Wheat which I grew in 1761, serves me for the year 1763.

As I always send to town more than I have occasion for to supply the wants of my family, particularly when it is good in quality and low in price, I have preserved Wheat, in the manner above related, for five years and upwards, without there being any visible difference betwixt the grain so kept, and that only one year old.

I have purposely made bread of both sorts at the same time, and diligently comparing one with the other, there appeared not to be the least advantage in point of goodness on either side.

It is true, that, apprehending the dryness of the corn might occasion some inconvenience in the grinding, I caused the old Wheat to be washed in several waters, till the water came away pure and unfullied;

for the first water was dirty, and of a brownish colour: the Wheat, being afterwards dried, grinds very well.

By this operation the bread becomes whiter and sweeter; and I have experienced the same with regard to new Wheat.

I may then safely conclude, that in this manner corn may be preserved much longer than the time I have mentioned above to have experienced, without suffering any sensible damage, particularly as all the danger to be apprehended must proceed from the inward moisture of the grain; which moisture must doubtless be insensibly dissipated in the space of five years.

If I mistake not, the following inferences may be drawn from the facts above-mentioned.

I. That threshing out Wheat as soon as possible after harvest, preserves it from the damage and waste which must necessarily be the consequences of keeping it too long unthreshed in the barn.

II. That by putting it up in sacks, when it is sufficiently dried, we guard against a winter's fermentation.

III. That the treffels keep it out of the way of rats and mice, and prevent its being damaged by any moisture which might proceed from the floor.

IV. That the sacks, being impregnated with the powerful bitterness of the ozier, keep it from being attacked by any kind of insect, even flies, so much do they avoid this bitterness.

V. That the room being close shut, prevents the alterations of the exterior air from having any sudden effect; on which account these alterations are to be less apprehended, and indeed scarcely at all.

VI. That in case any sudden tempests of wind and rain should damage the room, and expose the corn to be wetted, it will be a very easy task to remove the sacks, from the round surface of which
the

the water will run off without soaking in; and if any should by chance be wetted, it will be easy to discover where the damage is done.

VII. That every room which can be close shut is fit for this purpose; as a shed built of timber framework, and lathed and plaistered within, will be as fit for this use as the most elegant granary built of free-stone. This is no small advantage.

VIII. That, lastly, this method is neither troublesome, expensive, nor requires much attendance; the several operations being very easy, and to be done at several distant times.

The owner has it in his power, at the slightest view, to know what quantity of corn he is possessed of; and as he keeps himself the keys of his store-room, it is as safe as the money in his chest.

In my method, I guard, as much as possible, against the entrance of the air and light.

This way of preserving Wheat, in some sort, answers the end that is proposed by kiln-drying it, which consists of drying corn in order to promote its preservation. All the difference is, that one operation is quick and forced, and the other requires more care and time.

The question may be reduced to this single point, which of the two methods, with the most certainty, preserves the corn, without diminishing its natural substance, and with making the least alteration, with respect to its nutritive and salubrious qualities.

I think myself obliged to acknowledge, that the kilns will most probable contribute to the longer preservation of the grain; but then I cannot hesitate asserting, that the other method will promote most the preservation of those qualities in the corn which are so essential to the uses for which it is intended.

Let us now, as opposed to the method I propose, make a few remarks on the preservation of
Wheat

Wheat in magazines or granaries, where it laid in heaps.

It cannot but be acknowledged, that it is in this manner much more exposed to be injured by the alterations in the air; particularly in damp weather, the moisture soon penetrates the floors, and the corn suffers accordingly.

It is besides very rare to find any corn, after being twelve or fifteen months in the granary, but what is attacked by weevils and other pernicious insects.

In case the roof should not happen to be weather proof, the least cracks are most dangerous.

Let a single quart of water be, in summer time, poured into the middle of a large heap of Wheat, and it is incredible to think what damage will be done in a short space of time.

It is needless to enlarge on the infinite number of inconveniencies which are known to attend this method of preserving grain, and by which such heavy losses have been frequently sustained.

It may perhaps be objected, that this method, tho' very proper to be adopted by a private person, would be too expensive for a considerable magazine of corn, on account of the number of sacks which would be required.

I acknowledge that a considerable number of sacks will be necessary, yet is not this so expensive an article as may be imagined.

If the sacks are bought at the first hand, they will cost less than a shilling a piece, and, with care, they will last long enough amply to repay their first cost.

The sacks certainly contribute to preserve the corn in good order, prevent waste, and are a security against private embezzlements. Lastly, as they are very easily removed, the corn may more certainly be saved in cases of sudden fire or inundations. On the contrary, in these cases, how many difficulties are

are there to surmount when the corn is kept in large heaps in a granary.

Having no desire to form a scheme of a public nature, I have been content honestly, and in plain terms, to relate, what I have come to the knowledge of by many years experience, and to lay open the inconveniencies which may attend the laying up of Wheat in the methods hitherto practised.

This object is of too great importance for me to be under any apprehension, that any one will think meanly of me for writing on the subject.

I have omitted all long disquisitions, lest I should have extended this paper to too great a length.

For instance, if we exclude the air and light, no insects will annoy the corn; but can we at the same time be secure, that the Wheat will not ferment, grow musty, and suffer some alteration for the worse?

By guarding against the action of the air, we do not exclude the air itself, which is too ready to enter at every crack.

When air is not in motion it contracts a kind of corruption; is it not then natural, that it should communicate this corruption to bodies containing air? Let a dungeon, which has been long closely shut, be opened, and a disagreeable strong smell will surely issue from it; we must then conclude that a circulation of the air is necessary: the only question remaining is, how far this circulation may be permitted to take place, so that the alterations may not be too sudden.



ARTICLE. XIV.

*An Essay on the Observations which might be made respecting the Variations in the Atmosphere accompanying and preceding the different Seasons of the Year. Written by M. F. MICHELI DU CRET, Member of the Council of Two Hundred in the Republic of Geneva, in a Letter to * * * * **

“YOU have imposed on me, my dear Sir, a task which it is out of my power to perform. I am not naturalist good enough, neither have I made sufficient observations in the matter, to give you any information respecting the theory of the land winds, and the effects which result from their various combinations, with regard to the general temperature of a climate, or to agriculture.

“I have long formed an imagination, that, by placing observers on the various heights which form the part of the world we inhabit, from the seas to the highest mountains, and from thence descending again to the level of the waters, it would be possible to form some probable conclusions respecting the prognostics of the seasons.

“This idea, chimerical as it may appear, is amusing to me; how surprising would it be to steal, as it were, this secret from nature? Mathematicians search for the quadrature of the circle, and navigators for the longitude; neither have yet succeeded, yet have their endeavours been of use to society. The same, perhaps, might be said of my idea, respecting the prognostics of the seasons. We should discover, probably, what we were not in search of; and if we discovered nothing, we should, at least, have the satisfaction of knowing, that farther en-
quiries

quiries into this matter were vain. It seems to me, that if we could have extensive Meteorological tables, they would greatly forward this work.

Hitherto I have said no more than any body else might have told you: I perceive, nevertheless, that I have some confused ideas of this matter, which I scarcely know how to pen.

As they are only for your own reading, (for you will soon be sensible that they ought to extend no farther) I shall take little heed of the order in which I set them down.

The course of the sun governs that of the seasons; when it is at the lowest point, we have the winter solstice, and when it is at the highest, the summer solstice. If the globe we inhabit was perfectly round, and had no inequalities on its surface of mountains or hills, probably the variations of the seasons would be less considerable, and fewer in number. A powerful cause operating continually without obstacle, would almost always produce the same effect; let us then be thankful to Providence for the rugged surface with which our globe is surrounded. The high mountains, as you have on another occasion observed, serve instead of columns to support those large reservoirs of water suspended in the air, ever since the creation of the world, to serve the occasions of mankind. These same collections of water, agitated by the winds, of which they are at once the cause and effect, moisten the earth, and thereby give it fertility; the low mountains also, and the little hills, contribute to this effect. The course of nature is regulated by the laws of gravitation alone, and by these laws is every part of it kept in due order.

But these reservoirs would not afford sufficient moisture for the earth we inhabit, if the Omnipotent Being had not also made reservoirs of water in the bosoms of the highest mountains to form rivers, and

if he had not provided, for the supply both of the first and the last, the immense depths of the seas, whence the sun, by the sole power of its attraction, raises vapours without ceasing, which impelled by the action of the winds, are blended with the clouds, and form that wonderful order so well adapted to continue fertility to the earth, and supply the incessant wants of its inhabitants.

The condensation and rarefaction of the air in this manner, form the whole course of nature. Other laws, to us unknown, may perhaps have their influence; but it, nevertheless, appears to me, that this single principle is sufficient to explain all the phenomena which are known respecting the action of the winds. It is certain, that the irregularities on the surface of the earth are the causes of their various motions. I conceive it to be brought about in the manner following.

Suppose the atmosphere to be in as great a state of rest as it is possible, the action of the sun alone will then attract vapours from all the surfaces it enlightens in proportion to the degree of moisture they before contained. But as the mountains, the dry rocks, and the sandy plains, are less capable of yielding a supply of these vapours than the deep vallies, it is evident that, from this instant, the air not having so much play in these last as on the heights, will begin to be heated in a greater degree. After this the clouds or vapours will collect themselves together over the valley, and the air, being by this still more compressed, and more heated here than in the parts around it, will attract to itself the circumjacent air.

That warm air will attract that which is colder we every day experience in our houses. This fact then, which I think sufficiently demonstrated, comprehends, in my opinion, the cause of all winds, or, which is the same thing, the agitation of the air.

The earth by its form, and the sun by its course, have

have occasioned that some places are constantly either hotter or colder. The inhabited countries near the poles, and the tops of high mountains, are evidences of this. On the other hand, the equator, and all that part of the earth as far as the tropics, is, if we except the mountains, hotter than the temperate zones. The poles on the one hand, and the equator on the other, are then sufficient to cause a continual attraction and repulsion of the atmosphere; and there is great reason to think, that this cause occasions, either wholly, or in part at least, the trade winds in different latitudes. But as we are now only treating of land winds, providence, which seems to have made Europe more proper to be inhabited in all its parts than the other quarters of the world, has placed it almost entirely in the temperate zone, and has more intersected it with seas than Asia; the center of it is less elevated, and the several chains of mountains which cross it are so aptly situated, that they every way contribute to its being refreshed by moisture, insomuch that few places are uninhabitable for want of water. The inequalities of the surface of that part of the earth (Switzerland) we inhabit being so great as we know them to be, the consequence should every day prove an infinity of variations and modifications in the undulations of the air, particularly if we add to them the ever varying action of the course of the sun.

Experience indeed convinces us, that at the time of the solstices, or at least soon after them, when the sun is nearly opposite to the earth, the weather is less subject to great changes. As soon as the winter is well set in, the northerly winds; or which is the same thing, the air which comes to us from the polar circle, greatly influences our climate.

If there is at any time, in that season, a violent return of the sea or southerly winds, it is a rare instance, and well worthy of being examined into by a chain

of observations and observers ; but the infrequency of the exception serves to establish the rule, so that we may say, that in the winter season, we are generally subjected to the northerly winds ; and if sometimes our vanes seem to indicate a south wind, it only takes its rise from the heights of our mountains, and is cold in proportion, as it glides over the snows and fleet which fall on their summits.

This wind is not warm, except it comes to us from a greater distance, as from the Mediterranean, and sometimes from the tropics. Its duration and violence in surmounting the obstacles it meets with in its way, sufficiently indicate to us the strife it occasions in the atmosphere, to clear the way it has already passed, and that which it still has to pass.

This circumstance, which is very rare in the winter, becomes more frequent in proportion as we advance towards the spring. After the middle of February, we begin to see the first efforts which nature makes to deliver itself from the yoke it has long submitted to, but these first efforts have much the same effect, as with people who have been in the same situation, failing of success they contribute to make the yoke still heavier.

The first efforts of the sea winds serve only to bring on us, in February and March, a more violent reaction of the northerly winds ; because all that part of the world being yet frozen, the air which comes to us from thence, by a violent undulation, must necessarily partake of the nature of the place whence it takes its rise.

As we advance forwarder in the months of March and April, the struggles become more frequent, and the success more dubious.

If unfortunately the southerly winds remain masters of the field of battle for any considerable space of time, they forward vegetation, the plants advance in their growth, and the buds of the vines
begin

begin to unfold. I should be inclined to think, that at these periods (and experience seems to confirm me in the opinion) this alteration of the air is perceived as far as the seas of Holland, and even to the Baltic; but the triumph is of no long continuance. At the first rains which fall from the Alps, there ensues a violent attraction of the air from the pole, which is not yet thawed, the frosts return, and the young shoots of the plants, with the buds of the vines, are effectually destroyed.

You will perhaps ask me if I am quite certain this is nature's course? To this I shall answer, that it possibly is so, and it is to gain some insight respecting this matter, that I could wish some observers were properly stationed, and their observations compared. For though this course may have infinite variations, occasioned by many different causes, most of which are to us unknown, yet such part of it as is always the same, induces me to presume, or at least to conjecture, that there is more uniformity in this variety, than is in general imagined.

By the middle of May, or thereabouts, the face of nature seems entirely changed. If there is still any resistance in the extreme parts of the earth, the conflict is not in our country and at our expence, the northern parts being almost thawed, and the sun got to a considerable height. The ships which go on the whale fishery, when they enter the seas of Spitzberg, meet, they say, with violent tempests, accompanied with fleet, but this is naturally to be expected.

The operations of Nature, in this country, yield not towards the end of the spring to the great impulsions of the air; but then they are subject to others, which, though particular and local, equally merit our attention.

If the course of the seasons was now such as it was described by our ancestors, we should have warm
rains

rains in April, and plentiful dews, accompanied with heat, in May. But this course we have long been unacquainted with.

We are pretty well freed from the danger of frost in May, when the dews begin to fall plentifully in that month. We had none in 1762, but in their stead a north-easterly wind, which held twenty-two days.

We have now fine springs, but dry and windy; by which weather, if the vines are benefited, other plants are injured.

Many people in England imagine, that the cutting down the forests of Norway and Sweden occasions this desirable season to be backward; for, say they, the north winds have a freer course, and prolong their visits to us. A melancholy conjecture for posterity, if it should prove true!

We have, for many years, suffered innumerable inconveniencies from this alteration in the seasons, which inspired me with an idea of wishing, that, after a course of observations, we might be able to attribute it to some other cause.

By the end of May, and the beginning of June, our evils change their nature. We are very little troubled with the dry north-easterly winds; but then the sun by its great power melting the snow on our mountains, and heating, in a considerable degree, the air of our vallies, we of course have frequent rains. We have them too often at the beginning of June, and seldom miss of them at the latter end of that month. If we had a chain of observers only from Geneva to Milan, I am well satisfied that there would be found, at very small distances, a great variety in their observations. I should be inclined to imagine, that these varieties would be occasioned by the vallies and the different heights of the mountains, which form as it were streets or passages for the clouds.

Lakes and rivers, and even springs of any consequence, cause an attraction, which experience makes evident to us : we also know, that the weather is often fine in Italy, when we have heavy rains, and *vice versa*.

The heavy rains which fell during the whole summer of 1758, were well worthy of having observations made on their causes ; but as such a season very rarely occurs, we must not suppose it in the common course of nature.

Some days after the Solstice, or rather in the first week in July, the great heats begin, which continue without interruption during the whole month, and sometimes a part of August.

The more moisture there is in the earth in the months of June and July, so much the more are we exposed to sudden hail-storms.

That which is the cause of, and generally precedes a hail storm, is what we commonly call *gleams of sun-shine*, which are only the sun's action on the vapours rising in the vallies, and this action is more powerful when the earth is moist, than when the weather has been for some time before dry.

These storms do great damage, for when the hail falls in a quarter of the country, it causes an impetuous wind, which growing every moment colder, suspends the cause of the evil, at least for some days. If the storm has covered a considerable space of the country on both sides the Jura, though at different hours, we have then almost always a north-easterly wind, which I will term local, because it scarcely ever extends beyond the districts which border on those, in which the hail fell. I see no remedy for all this ; we must attribute it to our being situated at the foot of the mountains.

We have few variations at the end of the summer ; frequently drowth, sometimes continual rains, which when they last long are always accompanied by snow
on

on the Alps, and alter the weather for many successive days.

Autumn begins the 22d of September; and if there is then ever so little agitation in the northern seas, we quickly feel it.

The September blasts of wind are well known to the French mariners. The primary cause of them is the sun's declination. The cold, which has already got possession of the northern climates, endeavours to extend itself towards the south. It meets at first with powerful opposition; but this it insensibly overcomes.

The autumn is so far a pleasant and agreeable season, as we have often a long series of fine days; but this is not till the weather is changed from hot to temperate.

I am inclined to think that the contest of this season with that which succeeds it, is carried on, in our part of the world, during the whole month of October; and to this are we indebted for the fine days we enjoy in that month: *Deus nobis hæc otia fecit.*

We are also pretty well to pass in the month of November, when the sun, by declining in its height, makes the transition from temperate weather to the first degree of cold, which season the common people call St. Martin's summer. In this manner do our seasons succeed one to the other.

I have said a great deal on this subject, but perhaps it may be thought to little purpose. I imagined I saw something worth attention in this matter, and I am still of the same opinion; but I am at the same time sensible, that were my ideas carried into execution, many would deem them chimerical.

I should be glad if you could for the present set on foot two correspondencies; one on the Mount Jura, in a parish near the Lake of Joux, and the other beyond Berne, up the Aar, near the lakes
Thoun

Thoun and Brientz, as high up as possible. If you could also fix somebody in one of the Italian bailiwicks, it would be a considerable point gained.

A few years observations on the Lake of Joux, would serve either to corroborate my conjectures on the summer rains and winds, or would entirely confute them; the two last might teach us some curious particulars respecting the other seasons, especially spring; and indeed I must needs own, it is principally for this last purpose that I could wish proper stations for observations were appointed.

P. S. One of the first remarks you will probably make on these loose hints which I send you, will be, that if any one at Berne, or in any other place, should be inclined to describe, as I have done, the course of the seasons, their account would be different from mine. It doubtless would be so, at least with respect to many parts of it; and it is this difference, this variety, which being combined after a certain time and frequent observations, that would probably give us a knowledge of some useful and practical truths. If, on the contrary, nothing but doubt and uncertainty should result, posterity would at least know, that we had made some fruitless researches to acquire knowledge on this subject. This last winter, (1762) has been remarkably mild, insomuch that it is worthy of remark. The severe cold came from the north-east as far as our lake, (of Geneva) but did not enter it. A constant fog, occasioned probably by the vapours which arise from the lake, suspended its operations, or rather prevented it from passing mount Jura.

We had about nine or ten inches snow in the valley that surrounds Geneva, and this snow lay five or six weeks on the ground, at a time there was scarcely any on the mountains, and very little, as they say, in Switzerland.

The thermometer was pretty constantly from three to five degrees below Zero, once or twice eight degrees ; but it was when the fog entering the pores of the glass, put the thermometer into a kind of an artificial bath : at such times, every substance which it affects feels it sensibly, and in my opinion they are then ignorant of the true, time who trust to instruments for information.

You may easily, from the principles I have laid down, form a probable conjecture respecting the cause which prevented us from feeling the severe cold weather our neighbours to the north experienced. The weather in December was mild, and not subject to variation, no violent undulation coming from the south, as we frequently have about Christmas : we, by this means, escaped the reaction of the northerly winds in January ; the severe winters of 1709 and 1755, were to be ascribed to this cause alone. From hence we may naturally conclude, what I have been endeavouring to prove, that the action of the winds has a great influence over the temperature of our air.



ARTICLE. XV.

Enquiries into the Nature of such Distempers as make Wheat black, particularly the Smut, properly so called, and the Charbon or burnt grain. Extracted from the Elements of Agriculture, written by Monsieur DU HAMEL.

To the Authors of the Foreign Essays on AGRICULTURE and ARTS.

GENTLEMEN,

AS you invite your readers to correspond with you, and send you such translations as may answer the purposes intended by the plan you have laid down, I accordingly take pen in hand to make a few remarks on the Smut, as it is generally called in England, which often so greatly damages the crops of our farmers.

This distemper is very little understood on our side the water; no enquiries, or at least very few, having been made into its causes, and the manner in which the crops are infected is also as little known.

Most farmers confound together two different distempers, namely the Smut and burnt grain.

This last is what commonly goes by the name of Smut in England, the other being comprehended under the same general appellation. We shall, however, call that the Smut which is not infectious, herein following the example of the French; the other we shall call burnt grain.

It must not appear surprising, that farmers should

have confounded these distempers, there being many circumstances relative to them which might seem in some sort to favour such an opinion.

I. The smutty and burnt grain are both met with in the same fields.

II. When the grain is much infected with the Smut, a great number of burnt ears are generally found: these two distempers very commonly come together.

III. These two distempers attack several kinds of grain, the substance of which is farinaceous.

IV. In both distempers the farinaceous substance is converted into a powder more or less black, and of a bad smell.

These distempers have, nevertheless, characters, which should distinguish them one from the other; for this reason in the extracts which follow, Mons. Du Hamel treats of them separately.

This able naturalist, conjointly with his countryman M. Tillet, has carefully investigated the nature of these distempers, and the result of his observations, like a true citizen of the world, he has published for the benefit of mankind in general.

The extracts I herewith send you are somewhat long, and as the subjects are pretty fully handled, I should not do right to take up a number of pages with any observations I could make, for which reason I conclude myself, Gentlemen, your very humble servant,

Dover, Feb. 7, 1765.

AGRICOLA.

Of the Smut, properly so called.

There are three points to be considered: the characters of the Smut; the causes of it; and the means of preventing it.

Characters

Characters of the Smut.

Since 1751, we have observed in the Smut, properly so called, the following characters.

I. This distemper entirely consumes the germ and substance of the grain.

II. It does not only affect the ear, but the whole plant is in some measure affected when the distemper has got to a great height.

III. When a plant of Wheat is attacked, it is very rare to find an ear on any of the stalks exempt from it.

IV. In March and April, by carefully opening the sheath that covers the ear, and by examining the little ear which was not then above two lines in length, and was near the root, I have perceived the embryo already black, and attacked with this distemper: perhaps the other plants might have been infected later.

V. When the ear comes out of the hood, which the leaves form for it, it appears small and lean; the teguments of the grain are so altered, that the black dust appears thro' them; and thenceforward, instead of the grain, nothing is to be found but a black stinking dust, without substance.

As the particles of this dust have little cohesion, and the teguments are destroyed, it is easily carried away by the wind, or washed off by the rain; so that nothing is generally housed but the skeletons of ears; if any of the dust remains, it is taken off in the sifting, and I have not found it contagious like that of burnt grain.

M. Tillet has also observed, that corrupted ears are often found in the sheath, tho' the sheath, which appears green and well-conditioned, has no signs of a decay.

The upper part of the stalk of smutty plants is seldom straight at about half an inch beneath the ear.

ear. On pressing the stalk in this spot, it resists, and scarcely yields to the finger.

On cutting the stalk two or three lines beneath the ear, it proves almost entirely full of pith; so that a very small aperture is to be perceived at the heart, whereas in sound plants this aperture is large.

M. Tillet has hence concluded, that smutty plants are choaked up at the top of the stem.

Bearded wheats are as subject to Smut as those that have no awns. But neither M. Tillet nor myself have found any ears of rye smutted.

Enquiry into the Causes of Smut.

The Smut cannot, as has been hitherto imagined, proceed from the grains not being impregnated, since it affects and destroys the organs which distinguish the sexes of plants long before the time of impregnating.

It can neither be attributed to the wet hanging on the ears, to fogs, nor the heat of the sun; since we have seen ears smutty long before they were disengaged from the coverings afforded them by the leaves, which still continue green, if the distemper is not got to any great height.

These same observations absolutely overturn the opinions of such as think that the cause of the Smut is to be found in the grain already formed, but as yet of a milky substance.

It has been pretended that the dampness of the soil will occasion Smut; but it is not perceived that corn is more smutty in the bottoms of fields than in parts that lay higher; besides, why should one distempered plant be found amongst many that are healthy? Yet, as it appears that grain is more subject to smut in wet, than in dry years, it is possible that, though wet is no immediate cause of Smut,
it

it may be favourable to the progress of the distemper.

Some Naturalists have ascribed this distemper to insects. If I cannot absolutely contradict this, I can, at least, assert that, being at first of that opinion, all the researches I could make to establish its reality were of no effect.

I have, it is true, been shewed some Staphylins, and other insects on smutty ears; yet, as I found the like on those that were healthy, I conclude, with M. Tillet, that these insects are in no respect the cause of this distemper.

We are sensible that the corn-caterpillar destroys the farina, yet it does not cause the Smut.

Many flies deposit their eggs in these seeds; worms proceed from them and gnaw the seed; but we do not observe that they occasion any thing like the Smut.

M. Hales, being willing to try whether grain bruised with the flail became smutty, chose a certain number of the seeds of different sizes, and bruised them with a hammer; this seed sprouted, and bore ears that were not smutty.

An experiment, made by so able a Naturalist, subverted in this manner an opinion that had been formed on the cause of this distemper.

The dung of pigeons and sheep have by some been thought to cause Smut; but without reason. We have large dove-houses, the dung of which is spread on our Wheat-lands, where our sheep's dung is also laid, and we even fold our sheep there; yet it is not observed that these fields are more subject to smut than others. This opinion is therefore void of all proof.

M. Wolf imagined that Smut was occasioned by the unnatural form of the embryo: but M. Aimen has refuted this opinion, by demonstrating, that

that in certain plants the male flower is attacked by the Smut; and these flowers have no embryo.

M. Aimen has very judiciously observed, that the Smut cannot be owing to any defect in the sap, as all the parts of the plants, excepting the ear, appear healthy, and there are plants perennial in their roots, which seem very vigorous; yet is their seed every year smutty.

This same Naturalist, who has made some useful researches into the cause of the Smut, properly so called, says, that this distemper arises from an ulcer which, in the first place, attacks the stamina of the seed, and afterwards infects the different parts of the flower. But the remote cause of this ulcer will, perhaps, be required.

To discover this cause, M. Aimen examined several barley corns with a magnifying-glass; some were larger than others; many were hard, others yielded to the pressure of the nail: some were of a deep, others of a light colour; many were oblong, some rounder; their husks were cracked in several places; whereas in a natural state this part is smooth and even: finally in some he perceived black spots, and through the magnifying-glass these spots appeared to be covered with mould.

These barley corns were carefully sorted, laid in little heaps, and sowed a part, but in the same land.

All the grains that were mouldy produced smutty ears: the parched and shrivelled grains, and such as had been attacked by insects, either did not come up at all, or were not smutty.

He then took some sound and healthy grains; he sowed them, and some time afterwards took them up to examine them with the glass; some of them he found mouldy, and, putting them again into the ground, they produced smutty ears.

M. Aimen,

M. Aimen, without asserting, that there is no other cause of Smut, concluded from the experiments above mentioned, that mouldiness is one of the causes of the Smut.

It is not easy to conceive that this mouldiness, or, if you will, this kind of moss, is capable of causing this distemper; for as soon as the grain has sprouted, and formed its plant, the whole substance of the seed is exhausted.

Whether the husk rots or not, seems to be of little consequence to the plant, as it no longer depends for subsistence on the seed which had hitherto supported it. It is easily conceived that mouldiness may either kill a plant, or make it weakly. But it is not so apparent how this mouldiness can affect the organs of fructification only, and totally destroy them, without any other parts of the same plant being visibly affected; and this, though the plants should even be perennial.

As to the rest, M. Aimen relates facts; and, in some measure, to account for them, one might conjecture, on a supposition that the growth of plants is only an unfolding of their parts, that the organs of fructification, which existed though imperceptibly in the seed, were affected with mouldiness before the grain was put into the ground.

But let us keep to well-observed facts: it is of much more importance to collect them, than to be in haste to explain them by conjectures, which hitherto have been little founded on probability.

Methods of guarding against this Distemper.

To prevent this distemper, M. Aimen recommends that the finest and ripest grain should be chosen for seed; that it be thrashed without delay, and immediately limed, either to prevent its be-

coming mouldy, or to destroy the mould, if already formed.

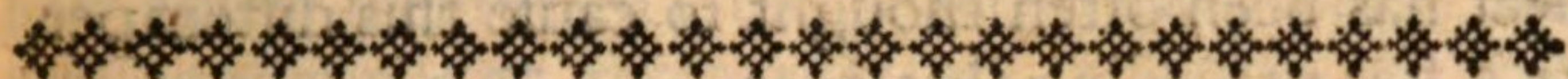
According to this principle, the lye recommended by M. Tillet should be equally serviceable in preventing the Smut, and preserving the ears from being burnt.

We shall make no addition to M. Aimen's advice, not having observed so much the nature of Smut as of the Charbon, or burnt ears. As this last distemper is much more terrible than the other, it has chiefly engaged our attention.

According to some observations made by M. Tillet, it does not appear that the black dust of the Smut, properly so called, is contagious: and we should speak more decisively in this matter, could we have collected a sufficient quantity of this black dust; but, as we have already said, there is little to be found in the barns, on account of its being before carried away by the wind and rain.

We recommend it to the lovers of Agriculture to make fresh trials, in order to find whether Smut is really contagious; but we warn them not to confound the Smut, properly so called, with the Charbon or burnt ears: this has led many Naturalists into errors.

ARTICLE



ARTICLE XVI.

Of the Charbon, or Burnt Grain.

THIS distemper of corn is confounded by almost every writer on the subject with the Smut, properly so called: it is, nevertheless, very different, and much more dangerous.

The Smut, properly so called, occasions the total loss of the distempered ears; but as the black dust is very fine, and the particles of it have no cohesion, the wind and rain carry it off, so that scarcely any thing is housed in the barn but straw, which is not infectious, and does very little damage to the flour.

The Charbon, or burnt grain, is, on the contrary often laid in the granary with that which is sound, to which it communicates a contagious distemper, and also darkens the flour, and gives it a bad smell.

Characters of the Charbon, or Burnt Grain.

The characters of this distemper are,

I. The plants that produce burnt ears are strong and vigorous.

II. The infected ears are not at first distinguishable from those that are healthy; but when they are past their bloom, they appear of a deep green colour, approaching to blue; they afterwards become whitish, and are then easily known.

As this change of colour is effected by the sun, when a number of white ears have been suddenly

perceived in looking over a wheat-field, the sun's heat has been often thought to cause this distemper, or a fog preceding that heat.

III. Though all the ears produced from one grain are commonly infected, yet M. Tillet, Aimen, and myself, have met with sound ears on plants that had produced others which were infected. We have even found some ears, part of which only were viated, and finally some grains enclosing partly a white flour, the remainder black dust.

IV. In burnt ears the chaff, or outward coat, was commonly found, with this single difference, that when the ears were near ripe, it appeared more withered and dry than in the healthy ears.

V. The bran which immediately enclosed the grain is not destroyed, as it is in the Smut, properly so called; but has consistence enough for the grain to preserve nearly its natural form, with a whitish look.

VI. The burnt grains are shorter, rounder, and lighter than such as are uninfected: they are sometimes larger, sometimes smaller. The furrow which runs the length of a grain of wheat is sometimes totally effaced, at others is visible: the pistils at the extremity of the grains are dried up.

VII. The bud of burnt grains is not visible.

VIII. Till the blooming season, there is very little difference betwixt the burnt grain and that which is healthy: they are only a little more swelled. But, in the blooming season, the infected ears assume a bluish colour; the chaff is more or less specked with small white spots: the grains are of a deeper green, and larger than in a state of Nature; and, as long as they preserve that colour, they adhere strongly to the chaff.

The distemper has often attacked very young ears whilst yet enclosed in the sheath. The stamina on the sides of the grain are then dried up and sickly;

sickly; the embryo in part takes the deep green colour above-mentioned; the infected ears have not the consistence of those that are healthy; in the same measure the distemper advances, the chaff becomes dry and whitish.

IX. The grains have some degree of firmness. On opening them, which may easily be done with the nail, there appears an unctuous, dark brown, stinking substance, not at all resembling the light dust of smutty ears; the dust of burnt grain has some cohesion, and through a microscope appears to consist of larger particles than that of the smutty ears.

X. Some time before the blooming season the grains appear to be filled with a whitish substance, a little burnt towards the bottom, and this colour extends by degrees over the whole ear: the grain then appears divided, as it were, into equal quarters by furrows; which disappear as the grain increases in size.

XI. By what has been said, it is evident that Smut infects corn much sooner than the Charbon.

XII. Grains that are much burnt are evidently incapable of sprouting. But I have had some sound grains taken from an ear greatly burnt, which, in a kitchen-garden, have produced very strong plants; and, though the birds disturbed my experiment, it appeared to me that there were some sound ears amongst many more that were infected.

XIII. A part of the burnt grain is bruised by the flail, and their black dust is scattered over the sound grain; this unctuous dust chiefly sticks to the hairy extremity of the grain near the bud, and there forms a black spot. Corn so affected is called Spotted Grain: many of the grains which escape the flail remain entire, on account of their lightness; a great deal is separated by casting, but the spotted grains remain as well as many that are burnt; and this

this is enough to darken the flour, and give it a taste.

XIV. To remedy this inconvenience, and make the best bread, they pass the corn through drum-sieves (*cribles à tambour*) made of pierced iron plates, like the graters with which they rasp tobacco; the corn is then washed, and all the light grains that swim skimmed off, which are for the most part burnt. The water takes off the spots, which are but superficial; for if a spotted grain is wiped, the spot immediately disappears.

Of the Cause of the Charbon, or Burnt Grain.

With respect to the cause of this distemper, I confess we are hitherto as much at a loss as in the case of Smut. Some have attributed it to dung; others to fogs; many to the heat of the sun; some to insects; others to the moisture of the land; and not a few to the seed being unripe: but these opinions are confuted by good observations, and by experiments very carefully made. We refer to what has been said of Smut.

It may seem improbable that a mere superficial dust, which only sticks to the bran, without penetrating the grain, should be so contagious as to infect all the grain it touches, with a distemper; what is more surprising is, that it should injure the organs of fructification only.

Yet, however improbable this may appear, the experiments made by M. Tillet put it past a doubt; they shew that the Farmers are not without reason cautious in avoiding to sow spotted grain.

As it would take up too much room to mention, at large, all the experiments made by M. Tillet, which are to be found in the papers published by him on that subject, I shall content myself with relating the
result

result of these experiments, and the inferences this able Naturalist draws from them.

Several writers having mentioned dung as the immediate cause of this distemper, and others having asserted that it was hereditary, all M. Tillet's experiments were calculated to clear up these two points: he was at the same time in hopes, by means of the same experiments, of finding some method of guarding against this terrible distemper.

I. The several kinds of dung had no visible effect in producing burnt grain. The infected seed produced as much burnt grain in the ground that was not dunged as in that which was. He did not find that dung had any effect either in favour of, or against the distemper.

II. Dung made of the straw of infected grain, did not seem to communicate the distemper; but the infected straw unrotted seemed to communicate it. Yet the effect was most visible when the dust of burnt ears was mixed with the earth.

III. All grain naturally spotted, whether it grew on the land, or was brought from another place, bearded wheat, summer-wheat, and wheat without awns, produced a great deal of burnt grain.

IV. Picked wheat taken from the finest ears, and carefully selected grain by grain, that none of it might be infected, being sowed, some in dunged, and the rest in undunged beds, without having received any preparation, yielded little or no burnt grain.

V. Some of this same picked wheat, being sprinkled with the dust of burnt grain, produced as many distempered ears as that which was naturally spotted.

VI. The picked wheat, being prepared with lime and a solution of the sea-salt, yielded still fewer infected ears than when unprepared.

VII. There were still fewer from what was prepared with lime and nitre.

VIII. Early

VIII. Early or late sowing seemed to be a matter of indifference.

IX. It appears by M. Tillet's experiments, several times repeated, that the dust of burnt ears is contagious, since sound wheat sprinkled with it, or sowed in rills in which that dust had been put, produced a great number of infected ears.

He also found that this dust, tho' exposed to a strong heat, as of sixty degrees, is still contagious, unless it is absolutely burnt by the fire when it has not that effect.

Tho' it is kept for years, its infectious quality continues as strong as ever

X. Some farmers wash the sacks in which they put their seed. And it appears by M. Tillet's experiments, that they are in the right; for, if the sacks had any of the dust on them, it would certainly infect some of the seed corn.

XI. M. Tillet thinks he has observed, that the infected plants are more susceptible of injury from frost than others.

If this is the case, hard frosts must be serviceable, since by destroying the infected plants, they would have the same effect, as if such plants had all been pulled up.

The land being cleared of these useless plants, would be better able to supply such as were sound with nourishment, and the crop would be exempt from infected ears, which are a great hurt to it.

XII. The black dust so contagious to wheat, is not so to rye or bere; but the dust of darnel is pernicious to wheat.

XIII. Smyrna wheat is less subject to this distemper than other grain; but summer-wheat is greatly injured by it.

Methods of guarding against this Distemper.

It must be allowed that the knowledge which has been acquired of the cause of this distemper, has put the curious observers in a train of finding proper preservatives.

In fact, as the dust of burnt grain infects all the grain it touches, it is probable that every method should be deemed efficacious, which is capable of taking away this dust, provided the virus has not from its first contact affected the interior part of the seed intended to be sowed. In this case, sieves, and washings with fair water, which in many places are used on spotted grain, may be mentioned as efficacious preservatives, as well as lime-water, which our farmers use, the strong brine used in some provinces of France, and the solution of arsenic, of which some persons have made such a secret: all these preparations should be of service; and, according to M. Tillet's experiments, they are so: yet they are often insufficient.

This point, therefore, merited to be cleared up by particular experiments, and with all necessary care.

M. Tillet set about it with spirit, and the following are the inferences that may be drawn.

I. The effect of the black dust on the seed is only superficial till it is put into the earth, not at all affecting the interior parts.

II. Therefore every means that can tend to clear it of the dust, must be of service to keep it healthy, and free from the distemper.

III. Grain perfectly free from this, and from rottenness, will yield no distempered plants.

IV. Grain blackened with this infectious dust, may be made healthy by clearing it of such dust.

V. Sifting seed, and washing it in several waters, lessen, it is true, the effects of the contagion; but

this is not sufficient, as many infected plants will be produced, tho' the seed was washed in several waters.

VI. Lime, which is more efficacious than water, is not always enough so. I shall observe, on this occasion, that seed was formerly limed in a manner different from what it is now.

The seed was then put into baskets, which were plunged into lime-water very hot. The seed was stirred in the baskets, and all that swam on the water was taken out with a cullender; by this means they got rid of the infected grain; and the good seed was better cleaned, than by only throwing as they do now, lime-water on a heap of seed, which is then stirred with a shovel, or by only mixing the seed with the flaked lime, reduced to powder.

One of our farmers, a careful man, being obliged one year to sow spotted seed, he limed it by immersion, in the manner above described; and the year following had no burnt grain.

Some experiments made in the country of Caux, by M. de Gonfreville have been published; they evince the good effects of lime used in the manner we have mentioned. And what is still a farther confirmation of this is, that whenever our farmers sow seed that has not been limed, their fields are amazingly infected.

VII. It is a good precaution to wash spotted grain in several waters; but it should be soaked in brine, and this brine should have lime flaked in it, by immersion, as we have described.

VIII. A strong brine of sea-salt is very good, and may be employed to great advantage in countries where salt is a merchandize.

IX. One part of nitre to nine parts water is more efficacious than sea-salt; this, therefore, should be used where nitrous earths abound.

X. Strong alkaline lyes are still better; salt wort, pot ash, ashes of tartar, lyes of common ashes much impregnated

impregnated with salt and human urine, or cows urine, alkalised by putrefaction; of these various articles such may be chosen as are most common.

For instance, in Normandy, ashes of sea-wrack, which are very cheap there, may be used. This, which is rejected for dying and lyes, as being more impregnated with alkaline and marine salt, may be advantageously used in the preparation of seed.

XI. As it is evident that seed picked with care yields very few infected grains, it must, of course, where a farmer has spotted grain, be of great advantage to him to change his seed in order to procure what is uninfected.

XII. M. Tillet's process may be comprehended in what follows: if the seed is spotted, it should first be washed in several clear waters, till the black is quite got off; it should then be put into the steep. If it is not spotted, soaking it in the following liquor will be enough. Make some lye, such as is used for linen, in a bucking-tub, putting four pounds of water to every pound of ashes.

If one hundred pounds of ashes are used and four hundred pounds of water, there will be two hundred and forty pounds of lye, to which must be added fifteen pounds of lime, which will be enough to prepare sixty French bushels of wheat, (20 English.)

When this steep is to be used, it must be heated as hot as you can bear your hand in it; the seed, being put into baskets, must be plunged into it, and stirred with a stick; the baskets must then be raised and kept up by sticks on the edge of the bucking-tub for the lye to drain; the seed being thus prepared must be laid on the floor of the granary till it is dry enough to sow.

If it is prepared long before it is wanted, it must be, from time to time, stirred with a shovel to prevent its heating; with this precaution it may be kept a month, or even a whole year.

We prepared some seed in this manner at M. Taponat's, near Rochefoucault in 1760; and in 1761 we saw with pleasure that the corn so prepared was uninfected, whilst in the neighbouring fields, a fourth, a third, and even half the crops were spoiled by this distemper.

All the trials that have been made evince, that acrid substances are proper remedies for this distemper: I also believe all the steeps to be good; but prefer M. Tillet's as being more acrid, and least costly.

I imagine lye that had been used for linen might do, only strengthening it with some sea-wrack, and putting twice as much lime. I know this lye to be very acrid, but cannot answer for its efficacy in preserving corn from being burnt, because for several years past we have scarcely had any of our grain so infected.

XIII. Several farmers in different provinces have used a solution of arsenic to prepare their seed. Great complaints have been made in all quarters of it.

Among others, a Physician published an essay to shew of how much importance it was to prohibit the use of this poisonous steep. He there enumerates all the accidents that have happened to the sowers and to the men that made the preparation, of which himself was a witness.

Since M. Tillet has given us a method simple and innocent in itself, but little costly and of great efficacy to clean spotted grain, it is to be presumed that no body will use this pernicious drug, from which such melancholy consequences may ensue, if by accident any of it should be mixed with the meal, and if the light corn is given to the poultry or cattle; besides, this poisoned seed must kill all the partridges and pigeons that eat the uncovered grain.

As some people are fond of making objections, it may, perhaps, be urged, that if the black dust was

so infectious, this distemper would make from year to year such progress, that in the end we should have nothing but burnt grain. But we need not be apprehensive in this respect; and a year in which much corn is infected, succeeds one in which scarcely any burnt grain was to be met with. Scarcely any was to be found in the crops of 1754, 1760, and 1761.

In reflecting on this objection, which has some weight, I think I have found an answer to it in M. Tillet's observations, which is, that hard winters, past all doubt killing the distempered plants, stop their progress.

It may also be said, that if this distemper is only caused by the infectious dust, how can it at first get footing in a province that was before unacquainted with it?

It is readily allowed, that this distemper may be attributed to other causes besides the black dust: but M. Tillet's experiments incontestibly prove this dust to be contagious; and his researches supply us with the means of lessening considerably, if not entirely extirpating this distemper: thus we may have larger crops, better bread, and corn more proper for keeping.

What a satisfaction must it be to a man to have made a discovery so useful to his fellow-creatures, whose chief food is the several sorts of grain? We shall soon see whether habit, supineness, and ill-judged œconomy in the farmers, will not prevent them from reaping any benefit from M. Tillet's labours, who yet proposes to them simple and cheap methods of attaining an end, which to them ought to be of infinite consequence.

ARTICLE



ARTICLE XVII.

An account of some Experiments made in the Year 1760, in the Parish of Surcy, the Election of Andely, in Normandy, in order to discover the true Cause of Wheat being burnt or smutty; with the Means of preventing this Misfortune. By M. DE GONFREVILLE.

Advertisement to the Reader.

THE Society of Agriculture at Rouen was well convinced of the utility of the following paper; because the method prescribed by M. de Gonfreville, who lives in the Vexin, to preserve wheat from being burnt, is more simple than any which has hitherto been proposed.

His experiments, added to the practice of the farmers of the district of Caux, many of whom wash their wheat before they lime it, when they suspect the seed to be infected, sufficiently prove that this method is infallible, when properly and carefully practised.

This remark is the more necessary on account of a considerable error in the first volume of M. du Hamel's *Elemens d'Agriculture*, lately published, where he says, page 327, that M. de Goufreville is satisfied with washing his seed in lime water. But it will appear, by the contents of the following paper, that this able cultivator particularly recommends, that the seed should first be well washed in common water before it is put into the lime-water.

[For an account of the manner of making M. Tillet's Lixivium, frequently mentioned in the course of these experiments, *see the last article, page 115.*]

THE

THE CAUSE of burnt or smutty grain was unknown to cultivators till M. Tillet, Member of the Academy of Sciences, discovered it; before him, some attributed it to the wind's blowing from certain particular points, or to certain phases of the moon at the time of sowing; others to the pigeons dung, which is frequently laid on the land, or to the dung dropped by sheep which are in the night folded on land intended for wheat.

The reiterated experiments made by M. Tillet have now convinced the world, that this misfortune arises solely from the black dust of infected grain sticking to the seed. This able naturalist was not content with discovering the evil, but he has also pointed out a remedy; and it must be allowed, that the remedy he has made publick is infallible: but the preparation of a Lixivium, and the other operations which he prescribes, will be with some difficulty adopted by many. His sentiments of patriotism, and his love for his country, will certainly induce him to approve of our endeavouring to render his remedy more simple, at the same time expressing how much we owe him; and we are persuaded it will give him pleasure to be informed, that washing the seed with common water, and liming in the same, produces the same effects as his Lixivium.

The experiments which I made in the seed-time of 1759, and which I greatly increased in number in 1760, evidently discover the evil and the remedy. Some gentlemen of knowledge, and experienced husbandmen, who came to see my experiments, a little before harvest, whilst the corn was yet on the land, were well convinced of the truth of this.

The first trials I made having happily met with the approbation of M. de Brou, Intendant of the Generalité, I am thereby encouraged to give an exact account of my last experiments, and I the more readily impose on myself this task, as it will be forwarding

warding the designs of a magistrate and a society (that of Rouen in Normandy) who have the public good alone in view.

I shall divide this essay into four parts ; in the first I shall exhibit a view of several plots of ground in which I made various experiments, of these plots I drew a plan, in which they were distinguished by numbers.

In the second part I shall, from this exposition, deduce proofs of the cause of this evil.

In the third I shall point out a remedy, and in the fourth part I shall discover the method of applying it, which every farmer may easily put in practice. To these I shall add some remarks, which may possibly have their use.

An Exposition of divers Experiments made in twenty-two Plots of Ground.

The first experiments I made last year were in small, and in an enclosed piece of land, but those made this year were more extended, and in the open field, on a piece of land 150 feet long and 50 feet broad, which I divided into three parts, and the whole into twenty two small plots, each containing twelve rows.

Six plots, which form the first part, were sown in September, the wind being in the west, on the third day of the full moon.

Eight plots, which form the second part, were sown the 7th day of October, the wind being south, and the moon almost at the end of its decrease.

The eight plots, of which the third part consists, were sown the 17th day of October, the wind being in the north, and on the first day of the moon's first quarter.

In order to examine whether there was any foundation for the other common opinions, I put pigeons
dung

dung into some plots, and sheeps dung into others. The whole will be fully explained by the account I shall give of the several operations in each plot, and by an exposition of what was the result thereof.

FIRST PLOT, *containing four Experiments, sown when the wind was in the west, the third Day after the Full-Moon.*

Three rows of sound wheat taken from the barn were sown, but the seed was first smeared with the dust of burnt grain, and was put into the ground without being either washed or limed.

At least two thirds of the ears, which grew in the above three rows, were burnt, and there were many smutty ears besides.

Three rows were sown with sound wheat, but it was first smeared as above with the dust of burnt grain, and sown after it had been limed in the ordinary way.

Of these three rows about a tenth part of the ears were found to be burnt, and there were also eight smutty ears.

The wheat sown in the next three rows was also sound; it was not smeared with the black dust before it was sown, but being first washed in common water, it was afterwards washed with the lye, according to the method laid down by M. Tillet, and before it was covered, some of the dust of burnt grain was sown over it.

In these three rows at least one half of the ears were burnt, and there were also several smutty ears.

The three last rows were also sown with sound wheat, but it was smeared with the dust of burnt grain, and before sowing, was first washed in plain water, and then steeped in M. Tillet's Lixivium.

There was not in these three rows a single burnt ear, all the ears being sound except four which were smutty.

SECOND PLOT, *in four Experiments, sown on the 27th of September, when the Wind was in the West, the third Day after the Full-Moon.*

The wheat sown in the three first rows was very sound; it was not smeared with the black dust, and was sown without being either washed or limed.

In the above three rows were only two burnt ears, and four smutty ears.

The three next rows were also sown with sound wheat, taken from the barn like that of the three first rows, and before it was sown it was limed in the ordinary way.

There was not in these three rows a single burnt ear, but there were two smutty ears.

The wheat sown on the three following rows was also sound, it was not smeared with the black dust, yet was steeped before sowing, but not washed in the Lixivium.

There was not a single burnt ear in the above three rows, but there were four smutty ears.

The three last rows were sown with the same wheat as those abovementioned, it was not smeared with the black dust, but being first washed in common water, was afterwards steeped in the Lixivium, prepared in the manner prescribed by M. Tillet.

In these three rows there was no burnt grain, but a few of the ears were smutty.

THIRD PLOT, *in four Experiments, this was sown September 27, the Wind in the West, on the third Day after the Full of Moon.*

The three first rows were sown with sound wheat not smeared with the black dust; it was sown without being

being either washed or limed, and before it was covered some pigeons dung was sown over it.

In the above three rows, one single burnt ear only was found, all the other ears being good and found.

The wheat sown in the three next rows was also found; before it was sown it was limed in the ordinary way, and before it was covered some pigeons dung was sown over it.

Not a single burnt ear was found in these three rows, but there were two smutty ears.

The three following rows were also sown with found wheat, it was not smeared with the black dust before it was sown, but it was steeped in the Lixivium, and over it, before it was covered, was sown some pigeons dung.

Not a single ear of these three rows was burnt, every one of them being good and found.

The seed sown on the three last rows was the same found wheat; before it was sowed, it was washed in common water, and steeped in the Lixivium, over it was sown some pigeons dung before it was covered.

In these three last rows not a single ear was burnt; on the contrary, they all proved healthy and found.

FOURTH PLOT, in four Experiments. This was sown on the 27th Day of September, the wind being in the West, the third Day after the Full of the Moon.

The three first rows were found wheat, it was not smear'd with the black dust, and was sown without being either washed or limed; but there was some sheep's dung sown over it before it was covered.

In these three rows there were four burnt ears, besides five that were smutty.

The seed of the next three rows was also found

good wheat; it was limed in the ordinary way, and sheep's dung sown over it as before.

In these three rows there was not a single burnt ear, but a few were smutty.

The wheat sown on the next three rows was found, it was not smeared with the black dust, and without being washed, was steeped in the Lixivium; sheep's dung being afterwards sown over it, but before it was covered.

There were no burnt ears found, and only three that were smutty.

The three last rows of this Plot were sown with the same wheat as that above mentioned; previous to the sowing it was washed in plain water, and afterwards steeped in the Lixivium; before it was covered, sheep's dung was sown over it, as in the former rows.

In these three last rows there was not a single burnt ear, nor one that was smutty.

FIFTH PLOT, in six Experiments, sown the 27th Day of September, the Wind in the West, on the third Day after the Full Moon.

The wheat sown in the two first rows was found, but it was smeared with the dust gathered up in a wheat granary, and was then sown without being either washed or limed.

In these two rows there were found six ears of burnt wheat, and four ears that were smutty.

The two following rows were also sown with sound corn, but it was smeared with the dust of a wheat granary, and before it was sowed, was limed in the ordinary manner.

There were in the above two rows four burnt ears, and six that were smutty.

Sound wheat was sown in the two next rows, but it was smeared with the granary dust, and before it was

was sown it was washed and steeped in common water, without any other preparation than some quick lime being dissolved in the last water.

There were no burnt ears in these two rows, but a few smutty ears.

The two next rows were sown with sound wheat; but before it was sown, it was smeared with dust gathered in an oat granary, and was put into the ground, without being either washed or limed.

No burnt ears were found in these two rows, but there were four smutty ears.

Sound wheat was also sown in the two following rows, but it was smeared with dust from an oat granary, and was sown without being washed, yet it was limed in the ordinary way.

No burnt ear was met with in these rows; but there were some smutty.

The seed of the two last rows was sound wheat; it was, however, smeared with dust from an oat granary; and previous to the sowing, it was washed and steeped in common water, with quick lime dissolved in it.

There were no burnt ears in these two last rows, but three smutty ears were found.

SIXTH PLOT, in four Experiments, sown the 27th day of September, the wind being in the west, and three days after the Full-Moon.

The wheat sown in the three first rows was smeared with the dust of burnt grain, and was sown without being either washed or limed.

At least two thirds of the ears were burnt, and several smutty.

The three next rows were also sound wheat, that had been smeared with the dust of burnt grain, but before it was sown, it was limed in the customary method, yet without being previously washed.

At

At least, a tenth part of the wheat ears were burnt, and there were also several smutty ears.

The seed sown on the three following rows, was sound wheat, but it was smeared with the dust of burnt grain; however, previous to the sowing, it was washed and steeped in common water, without any other preparation, but quick lime being dissolved in it.

There was not in these rows, a single burnt ear, but there were a few smutty.

The wheat sown on the three last rows was sound, it was not smeared with the dust of burnt grain; previous to the sowing, it was washed and steeped in the Lixivium; and before the seed was covered, some of the above dust was sown over it.

One half of the ears were burnt, and there were also several smutty ears.

SEVENTH PLOT, in four Experiments, sown the seventh day of October, the wind in the south, the last day but one of the Full-Moon.

The seed was the same as that used in the first plot.

The wheat used for seed in the three first rows was sound; it was smeared with the dust of burnt grain, and was sown without being either washed or limed.

About two thirds of the wheat ears in these rows were burnt, and there were also several smutty ears.

The two following rows were sown with the same wheat, smeared in the same manner, and was limed only after the ordinary manner.

In these rows about a tenth part of the ears were found to be burnt, and there were also five smutty ears.

The wheat sown on the three next rows was also smeared with the dust of burnt grain, but previous to the sowing it was washed and steeped in the Lixivium

vium prepared in the manner prescribed by M. Tillet.

Not a single burnt ear was found in these rows, for they were all found, a few smutty ears excepted.

The three last rows were sown with found wheat, which was not smeared with the dust, but previous to the sowing it was washed and steeped in the Lixivium, and before the seed was covered the dust of burnt grain was sown over it.

Above half the ears were burnt, and there were also several smutty ears.

EIGHTH PLOT, in four Experiments, sown the seventh day of October, the wind in the south, on the last day but one of the Full-Moon.

The seed was the same as that used in the second plot.

The three first rows were sown with found wheat; it was not smeared with any dust, and was sown without being either washed or limed.

There were here no burnt ears, and only three that were smutty.

The wheat sown on the three next rows was also found; it was not smeared with dust, neither was it washed before sowing, but it was limed in the ordinary way.

There was not in these rows a single burnt ear, all of them being good, found, and healthy.

The three following rows were sown with the same found corn, not smeared; it was not washed previous to the sowing, but it was steeped in the Lixivium after quick lime had been dissolved in it.

The ears of these three rows were all found, except a few that were smutty.

The wheat sown on the three last rows was very found, neither was it smeared with any dust, but
previous

previous to the sowing it was washed and steeped in the Lixivium according to M. Tillet's instructions.

Not a single burnt ear was found, all being found and healthy.

NINTH PLOT, in four Experiments, sown the seventh day of October, the wind in the south, on the last day but one of the Full-Moon.

The seed was the same as that used on the third plot.

The seed used on the three first rows was found; it was not smeared with any sort of dust; it was sown without being either washed or limed, and before it was covered, pidgeon's dung was sown over it.

There was not a single burnt ear; four of the ears were smutty.

The three next rows were also sown with found wheat, not smeared; previous to the sowing, it was limed in the customary way, and before it was covered some pidgeon's dung was sown over it.

Two burnt ears were found here, and a few that were smutty.

The wheat sown on the three following rows was very found, it was not smeared; it was steeped in the Lixivium, and before it was covered pidgeon's dung was sown over it.

Not a single burnt ear was found, all of them being found and healthy.

The seed used on the three last rows was also very found wheat; previous to the sowing it was washed and steeped in the Lixivium, and before it was covered pidgeon's dung was also sown over it.

All the ears were found and healthy, except two that were smutty.

TENTH PLOT, *in four Experiments, sown the seventh day of October, the wind south, on the last day but one of the Full Moon.*

The seed was the same as that of the fourth plot.

The three first rows were sown with sound wheat, not smeared with any dust; it was sown without being either washed or limed, and before the seed was covered, some sheep's dung was sown over it.

There were some burnt ears here, and some that were smutty.

The wheat sown on the three next rows was sound, and was not smeared with the infecting dust; previous to the sowing it was limed in the ordinary way, and before the seed was covered, sheep's dung was scattered over it.

Not a single burnt ear was found, all being sound and healthy.

The three following rows were sown with the same sound wheat at those last mentioned, previous to the sowing, the seed was steeped in the Lixivium, and before it was covered, some sheep's dung was sown over it.

All the ears were sound and healthy, except a few which were smutty.

The seed of the three last rows was sound wheat, it was not smeared with the infecting dust of burnt wheat; previous to the sowing, it was washed and steeped in the Lixivium prepared according to M. Tillet's directions, and before it was covered some sheep's dung was sown over it.

There was not in these three rows a single burnt ear.

ELEVENTH PLOT, *in six Experiments, sown the seventh day of October, the wind south, last day but one of the Full Moon.*

The seed was of the same kind as the fifth plot.

No. 2.

S

The

The two first rows were sown with sound wheat, but it was smeared with some dust swept up in a wheat granary, and was sown without being either washed or limed.

There were in these rows seven ears of burnt wheat, and five smutty ears.

The seed of the two following rows was also smeared with the wheat granary dust, and previous to the sowing was limed in the ordinary method only.

There were found here two burnt ears, and four smutty ears.

The two next rows were sown with wheat smeared also, with the above-mentioned dust, but previous to the sowing the seed was washed and steeped in common water, without being any otherways prepared than having some quick lime dissolved in the last water.

Not a single burnt or smutty ear was found in these rows.

The wheat sown in the two following rows was sound; but it was smeared with dust gathered up in an oat granary, and was sown without being either washed or limed.

These were no burnt ears, and only two smutty ears.

The two next rows were sown with sound wheat, but smeared with the oat granary dust, and previous to the sowing, it was only limed in the ordinary way.

Not a single burnt ear was met with, and but a few smutty ears.

The seed sown on the two last rows was also smeared with the same oat granary dust; but previous to the sowing, it was washed and limed in common water.

There were no burnt ears, and but a few that were smutty.

TWELFTH

TWELFTH PLOT, in four Experiments, sown the seventh day of October, the wind south, the last day but one of the Full Moon.

The seed was the same as that of the first plot.

The wheat sown on the three first rows was sound; but it was smeared with the dust of burnt wheat, and was sown without being either washed or limed.

At least one third part of the ears was burnt, and there were besides several smutty ears.

The three following rows were also sown with sound wheat, but smeared with the contagious dust; and before the seed was sown it was limed in the ordinary method, yet without previously washing.

About an eighth part of the ears was burnt, and there were five smutty ears.

Sound wheat, but smeared with the infecting dust, was also sown on the three next rows; the seed was however steeped in the Lixivium, recommended by M. Tillet.

Not a single ear was either burnt or smutty.

The wheat sown on the three last rows was very sound, and was not smeared with the contagious dust; previous to the sowing the seed was washed, and steeped in the Lixivium; but before it was covered the dust of burnt grain was sown over it.

About half the ears were burnt; and there were also several smutty ears.

THIRTEENTH PLOT, in three Experiments, sown the seventh day of October, the wind south, the last day but one of the Full Moon.

The seed of the four first rows was sound wheat taken from the barn; but it was smeared with the contagious dust of burnt grain, and was sown without being either washed or limed.

At least two thirds of the ears were burnt; and there were also several smutty ears.

The four following rows were also sown with sound wheat, smeared like the seed of the four last mentioned rows; but previous to the sowing it was limed in the ordinary way without being first washed.

At least a tenth part of the corn was burnt; and there were also eight smutty ears.

The wheat sown on the four last rows was sound; but it was smeared with the contagious dust, and previous to the sowing, it was washed and steeped in common water; no otherwise prepared, than by having quick lime dissolved in it.

Not a single burnt ear was found in these rows. There were six smutty ears.

FOURTEENTH PLOT, in three Experiments, sown the seventh day of October, the wind south, the last day but one of the Full Moon.

The seed was ordered like that used on the thirteenth plot.

The four first rows were sown with sound wheat; but it was smeared with contagious dust, and was sown without being either washed or limed.

At least two thirds of the ears were burnt, besides several that were smutty.

The four following rows were sown and managed in the same manner as those of the second experiment, in the thirteenth plot.

At least a tenth part of the ears were burnt; and there were also several smutty ears.

The four last rows were in like manner smeared with the contagious dust. Before the seed was sown, it was washed and steeped in common water without any preparation, save that a little quick lime was dissolved in the last water.

There

There was not a single burnt ear found, but there were some smutty ears.

FIFTEENTH PLOT, *in four Experiments, sown the 17th Day of October, the Wind North, the first Day of the first Quarter of the Moon.*

The seed was ordered like that used in the first Plot.

The wheat sown on the three first rows was smeared with the dust of burnt wheat, and was sown without being either washed or limed.

About two thirds of the ears were burnt, besides there being several smutty ears.

The seed of the three following rows was smeared with the same contagious dust, and previous to the sowing it, only limed in the ordinary way.

At least a tenth part of the ears was burnt, and there were several smutty ears.

In the three next rows the seed was also in like manner smeared, but previous to the sowing it was washed and steeped in the Lixivium, prepared according to M. Tillet's directions.

There was not a single burnt ear, but there were a few smutty ears.

The wheat sown on the three last rows was very sound, it was not smeared with any dust, it was washed and steeped in the Lixivium, and previous to its being covered, the contagious dust of burnt wheat was sown over it.

Above half the ears were burnt, and there were also several smutty ears.

SIXTEENTH PLOT, *in four Experiments, sown the 17th Day of October, the Wind North, the first Day of the Moon's first Quarter.*

The seed was managed like that of the second Plot.

The three first rows were sown with sound wheat, it was not smeared with any dust, and was sown without being either washed or limed.

Not a single ear was burnt; a few were smutty.

The seed of the three following rows was also sound, and not smeared; previous to the sowing it was limed in the ordinary method.

There were neither burnt nor smutty ears found in these rows.

The wheat sown on the three next rows was not smeared, it was very sound; and previous to the sowing it was steeped in the Lixivium, but was not washed.

There were no burnt ears found, and only two that were smutty.

The seed of the three last rows was also very sound, neither was it smeared; and previous to the sowing, it was washed and steeped in the Lixivium, in the manner prescribed by M. Tillet.

All the ears were sound and good, except a few that were smutty.

SEVENTEENTH PLOT, *in four Experiments, sown the 17th Day of October, the Wind in the North, the first Day of the Moon's first Quarter.*

The wheat sown on the three first rows was very sound, it was not smeared with any dust, was sown without being either washed or limed; but before it was covered, pigeon's dung was sown over it.

There

There were two burnt ears, and four that were smutty.

The three following rows were also sown with sound wheat, not smeared; previous to the sowing, it was limed in the ordinary way, and before it was covered, pigeons dung was sown over it.

There were no burnt ears found, but a few of the ears were smutty.

The same sound wheat above mentioned was sown on the three next rows, it was not smeared with any dust; previous to the sowing it was steeped in the Lixivium, and before the seed was covered, pigeon's dung was sown over it.

There was neither a burnt nor smutty ear in these rows.

The wheat sown on the three last rows was sound and good; previous to the sowing it was washed and steeped in the Lixivium, and before it was covered, pigeon's dung was sown over it.

The ears were all sound, except a few that were smutty.

EIGHTEENTH PLOT, in four Experiments, sown the 17th Day of October, the Wind North, and the Moon being in the first Day of its first Quarter.

The seed was ordered like that used in the fourth Plot.

The three first rows were sown with sound wheat, not smeared with any dust, and the seed was sown without being either washed or limed; but, before it was covered, some sheep's dung was sown over it.

There were four burnt ears, and six that were smutty.

The wheat sown on the three following rows was sound and good, it was not smeared with any dust, but previous to the sowing it was limed in the ordinary way, without being washed; and, before the seed was covered, sheep's dung was sown over it.

There

There was not in these rows a single burnt ear, but four of the ears were smutty.

The seed used on the three next rows was found and good wheat, it was not smeared with dust; previous to the sowing it was steeped in the Lixivium, and before it was covered, sheep's dung was sown over it.

There were no burnt ears, but a few were smutty.

The three last rows were sown with good wheat, not smeared; previous to the sowing it was washed and steeped in the Lixivium, according to M. Tillet's directions, and before the seed was covered sheep's dung was sown over it.

The ears were all healthy, except a few that were smutty.

NINETEENTH PLOT, in six Experiments, sown the 17th Day of October, the Wind in the North, on the first Day of the Moon's first Quarter.

The seed was managed the same as that of the fifth plot.

The wheat sown on the two first rows was found and healthy, but it was smeared with some dust swept up in a wheat granary, and was sown without being either limed or washed.

There were found in these rows four burnt ears and three that were smutty.

The seed of the two next rows was also found, but it was in like manner smeared with the wheat granary dust, and previous to the sowing was simply limed in the ordinary method.

There were two burnt ears, and five that were smutty.

The two following rows were sown with the same found wheat, but smeared with the wheat granary dust, and previous to the sowing, it was washed
and

and steeped in common water, no otherwise prepared than by having some quick lime dissolved in it.

There was not a single burnt ear, but there were several that were smutty.

The seed sown on the two next rows was found, but smeared with dust swept up in an oat granary, and was sown without being either washed or limed.

No burnt ears were found, but there were five smutty ears.

The two following rows were, like the rest, sown with sound wheat, smeared also with oat granary dust, it was not washed previous to the sowing, but was limed in the ordinary way.

There were three burnt ears, and a few that were smutty.

The wheat sown on the two last rows was found and healthy, but it was in like manner smeared with oat granary dust, and previous to the sowing it was washed and steeped in common water, in which some quick lime had been dissolved.

There were no burnt ears found, and only three smutty ears.

TWENTIETH PLOT, in four Experiments, sown the 17th Day of October, the Wind North, on the first Day of the first Quarter of the Moon.

The seed was prepared in the same manner as was that of the first plot.

The seed sown on the three first rows was smeared with the contagious dust of burnt wheat, and was put into the ground without being either washed or limed.

At least two thirds of the ears were found to be burnt, there were also several smutty ears.

The wheat sown on the three following rows was in like manner smeared, but previous to the sowing it was limed in the ordinary way, but not washed.

No. 2.

T

Near

Near half the ears were burnt, and four of them were smutty.

The three next rows were sown with wheat, smeared in the same manner; and previous to the sowing it was washed and steeped in the lixivium, according to M. Tillet's directions,

All the ears were found, healthy, and good.

The wheat sown on the three last rows was very found and healthy, it was not smeared with any dust; previous to the sowing, it was washed and steeped in the lixivium, according to M. Tillet's instructions, and before the seed was covered, the dust of some burnt wheat was sown over it.

Above half the ears were burnt, and several were smutty.

TWENTY-FIRST PLOT, *in three Experiments.*

The seed was prepared like that sown in the thirteenth and fourteenth plots.

The seed sown on the four first rows was found; but previous to the sowing it was smeared with the dust of burnt wheat, and was put into the ground without being either washed or limed.

At least two thirds of the ears were burnt, and there were also several smutty ears.

The four following rows were also sown with wheat smeared in the same manner; but previous to the sowing it was limed in the ordinary way, without being washed.

About half the ears were burnt, and there were also several smutty ears.

The same smeared wheat was sown on the four last rows, but previous to the sowing it was washed and steeped in common water, without any other preparation than its having quick lime dissolved in it.

All the ears were good and very healthy, except a few that were smutty.

TWENTY-

TWENTY-SECOND PLOT, in three Experiments, sown the 17th Day of October, the Wind in the North, on the first Day of the Moon's first Quarter.

The wheat was the same as that used for the seed of the twenty-first Plot.

The four first rows were sown with sound seed; before it was sown, it was smeared with the dust of burnt wheat, and was put into the ground without being either washed or limed.

About two thirds of the ears were burnt, and several were smutty.

The wheat sown on the four next rows was also in like manner smeared, but previous to the sowing it was limed in the ordinary way without being washed.

Near half the ears were burnt, and several were smutty.

The four last rows were also sown with smeared wheat, but previous to the sowing it was washed and steeped in common water, in which quick lime had been dissolved; this water had no other preparation whatever.

All the ears were good, very healthy and sound.

Proofs respecting the efficient Cause of the Evil.

We find by the above experiments, that no position of the winds, no phases of the moon, occasioned the least difference in these trials. The wheat which was smeared with the contagious dust, and sown without any preparation, was infected nearly in the same degree, and that which was washed previous to the sowing, though it was smeared with the same dust, produced a sound grain in return.

We also find, that the seed which had pigeons or sheep's dung mixed with it, was not any ways de-

trimented by such mixture. It is not therefore either the wind, the moon, pigeons dung, or sheeps dung, which occasions our having burnt wheat; this evil is to be attributed to nothing but the dust of the burnt wheat, which sticks to the seed, and occasions more or less damage in proportion to the quantity there is of it; from all which it follows, that to prevent this evil we need only cleanse the seed well.

It is enough for plain farmers to know in general whence proceeds the evil, and to have a remedy confirmed by experience pointed out to them. Let us leave it to naturalists to explore the original causes, and discover them in learned dissertations. I propose for their consideration only one single fact, which may be esteemed a phænomenon.

A grain of wheat forms in the earth a pretty large fibrous root, whence proceed several ears; of these frequently but one, two, or three at most are burnt, very seldom all of them; sometimes the corns in the same ear are entirely burnt and infected on one side and quite sound on the other; at other times they are even intermixed in the same ear, that is to say, on the side of one sound and healthy kernel there will be another that is burnt.

In the year 1759 I caused several of these ears, which were in part burnt, to be gathered for me; I carefully took out all the healthy corns, and in 1759 sowed them without washing; they produced pure, sound, untainted wheat.

This observation is worthy the attention of naturalists; for my part I stick to such experimental enquiries as may be of use to farmers.

A Method of preserving Wheat from being burnt.

As the reiterated experiments which have been made prove beyond a doubt, that the dust of the
burnt

burnt grain is the sole cause of the evil, and that it infallibly communicated it, we must necessarily judge it essential that the seed should be thoroughly cleansed of this dust.

The hand-seives and the winnowing-screens which farmers successively use, are not sufficient to answer this purpose of thoroughly cleansing the seed wheat; the dust which is contained in burnt wheat is unctuous, and sticks to the seed so close, that the most violent motion cannot entirely detach it.

This fact being well known to M. Tillet, set him upon discovering some method of getting rid of this glutinous substance, and for that purpose he thought that the lixivium, for the making of which he has given a receipt, was requisite. It indeed succeeded, the repeated trials he made, those which I made last year, and continued the present year, sufficiently prove this.

Being sensible, however, that the trouble and small expences which attend this preparation of the seed, would hinder common farmers from adopting the practice, I was willing last year to try whether simply washing the seed would not be sufficient. I have this year made the experiment more at large, and I constantly found that plain water had the same effect as the lixivium. I have also learned, that, several years ago, one of the principal farmers in the district of Vexin, having a considerable quantity of burnt grain in all his harvest, bethought himself of washing all his seed before he limed it, and the following crop was quite healthy and sound; for these reasons I am resolved to continue the practice of this way of preparing the seed, it is simple, costs nothing, and every farmer may, with the greatest ease to himself imaginable, adopt it.

A simple

*A simple and easy Method of cleansing Seed Wheat from
the Dust of burnt Grain.*

You must procure two barrels, with one of the heads of each taken out; in one of them common water is to be put, such as may happen to be at hand, and in the other some lime is to be slaked with boiling water in the usual way.

There must be one or two baskets, not made too close in the wicker, the handles of which must be at the top. These baskets must be of such a size as easily to go into the barrels, and hold about three pecks of wheat.

About a peck and a half of wheat is put into one of these baskets, which is then together with the wheat plunged into the barrel of plain water; the wheat must be well stirred with the hand, or a small shovel, the basket being at the same time successively raised and plunged in the water, which must be repeated three or four times; by this operation the wheat is entirely cleansed of the dust, which swimming on the top of the water, is taken off with a skimmer, and when the water appears to be blackened with the dust, it is to be thrown away, and fresh water put into the barrel.

The wheat in the basket being in this manner well stirred, and entirely cleansed, the basket is hung up to drain, after which it is plunged into the barrel in which the lime had been slaked; but, before it is put in, the water should be well stirred at the bottom, because the lime easily and speedily precipitates itself; without this precaution the wheat would not imbibe enough of it.

The basket is to be plunged two or three times in the limed water, after which it is left two or three minutes to drain; and the wheat being thus washed and limed, is put into a corner of the granary,
where

where it speedily dries, and is fit for sowing the next day. If, however, it should be necessary to leave it several days without using it, to stir it with a shovel may not be amiss for fear of accidents.

Observations.

This method of preparing the seed is neither expensive, tedious, nor difficult: I prepared last year in this manner fifteen comb of seed wheat; with three besides myself, we were only four hours washing and liming this quantity: it is true I had three baskets, one of which was draining whilst we were using the two others, and this in some measure forwarded the work. I sowed this wheat on a piece of land, and there were scarcely any burnt ears in the crop.

The few ears which were burnt in this crop, produced from washed seed, proceeded from my neglecting at first to take off the black dust, which swam on the water, with a skimmer, this I afterwards did.

The burnt ears in this crop were not nearly so many in proportion as in my other fields where the seed used was not washed; they were indeed so few, as not to be worth speaking of, had I not resolved to tell the whole truth.

The crop which this field yielded me, is this year to supply me with all the seed wheat I shall want to sow, in the whole one hundred acres.

I propose in like manner to wash fifteen comb of this crop, which I shall sow apart by itself, and the wheat it yields will furnish me with seed wheat for next year.

By continuing this practice for several years, I am pretty certain I shall have no burnt wheat; because the seed will be well cleansed of all impurities.

Supposing it should even be necessary to continue
this

this practice for several years, yet is it so easy and cheap, that no good farmer ought to neglect doing it: but in all probability the evil would, in the space of about three years, be rooted out.

In support of this assertion we may mention the following instance of a farmer in the sub-delegation of Andely, who says, That having had the good fortune at first to use clean pure seed wheat, which he has not changed for twenty years past, he has not had a single ear of burnt wheat, though his neighbours have been frequently troubled with it.

This man farmed for many years some land on the borders of the river Seine, where the soil is half sand, and half black mould; and for two years he has been settled in the district of Vexin; yet though he sowed his land in the usual way, with any wind, and when the moon was at any age, though he manured with pigeons dung, and constantly folds his sheep, he has always found crops of wheat; whence we may conclude, that the whole depends on having clean pure seed.

There is also some room to hope, that washing the seed will not only preserve the crop from being burnt, but also from the smut: I do not yet affirm this; but I have observed, that I have much less of it in the crop that came from the washed seed.

Though the quantities of water and lime that are necessary for liming seed are well known, yet, to remove every doubt, it may not be amiss to give some account of my method of managing in this matter.

I put into one barrel about twenty-five gallons of water, which served to wash the wheat; in the other barrel I put the like quantity, out of which about six gallons were boiled to flake the lime, of which there was about six pecks. This quantity was sufficient to lime the fifteen combs of wheat above-mentioned.

ARTICLE



A R T I C L E XVIII.

An Essay on the Culture of Parsneps in the open Field, as Food for Cattle; extracted from several Letters written by M. LE BRIGANT, Rector of Plouezoch, in Bretagne.

PARSNEPS are cultivated as food for cattle in several parts of the province of Bretagne, but as this useful practice is not yet sufficiently extended, it may not be improper to treat in this place, of their culture in the open field.

For this purpose, we cannot have a better guide than M. Le Brigant, who has taken the trouble of writing several letters to us on the subject, with which experience has made him very conversant.

Parsneps should be sown on land which has been dunged the preceding year, and they succeed particularly well after barley. The land should be deep plowed, and brought into good tilth.

Whilst the plow is at work, there should be a number of men provided with spades or shovels, whose business it is to clear the earth from the bottom of the furrow, and cast it on the ridge the plow has turned.

The whole field is to be thrown into lands ten or twelve feet wide, and between every two lands a trench should be dug, the workmen throwing the earth that comes out of it on the lands on each side.

If any small clods are still remaining, they are to be broke with a rake, and the whole surface laid as level as possible, excepting that the lands are to have an easy slope on each side, towards the trenches.

The earliest time of sowing the seed should be the

No. 2.

U

latter

latter end of February; and the latest, the end of March.

The seed is covered by briskly raking the land.

It is customary to sow with them, at the same time, Windsor beans; and to plant cabbages on the edges of the lands.

The Parsneps must by all means be sown very thin, and if in some spots they should come up too thick, a part of them must be drawn.

As soon as the weeds begin to make their appearance, they must be carefully hoed and weeded; which work should be more than once repeated.

The Parsneps may be taken up the end of October, but it is much better to wait till the end of November. They are taken up either with a shovel or a spade.

When they are all out of the ground, they are closely piled in a dry place, in order to their being kept a long time.

Parsneps are very useful to feed, and even fatten all sorts of cattle. Horses, oxen, cows, and hogs, are all equally fond of this nourishing root.

The Parsneps are at first given to them raw, either cut in slices, or slit their whole length into quarters.

As soon as ever the cattle seem to disrelish them, the Parsneps must be cut into slices, and put into a chauldron or copper, in which they are to be pressed down as close as possible.

When this is done, some water is poured into the vessel, to fill up the cavities, and the whole is boiled.

In this state the cattle will eat them with astonishing greediness, and are sure no more to take a disrelish to them.

The hogs in Bretagne have no other food in the winter season; and when fodder is scarce, the cows there eat nothing but Parsneps.

With respect to horses, some people say Parsnips make

make them sluggish, and withal so nice, that they will rather starve than afterwards eat any other food. It is also asserted, that they hurt the eyes of horses, and make their legs swell.

From the result of M. Le Brigant's experience we find, that a field sown with Parsneps yields three times as much profit, as the same field would have yielded had it been sown with wheat; yet wheat one year with another, in the district where this gentleman lives, yields a return of nine for one.

We must also observe, that the field produces besides, the same year, a crop of cabbages, and another of Windsor beans; and that the land is in excellent order to bear, the ensuing year, a crop of wheat, or even of flax.

Such considerable advantages would induce us generally to recommend the culture of Parsneps, but for an observation M. le Brigant makes, on the nature of the soil in his parish.

He says, they have very little clay there, the soil being neither stiff nor moist, but stoney and light; and that the farther you go from the sea, the less proper the land is for Parsneps.

It would be of universal advantage, were some careful experiments made, to try whether Parsneps might not to profit be raised on a stiff loam.

It were to be wished, that this root was equally well adapted to thrive in every soil, as it supplies all sorts of cattle with plenty of very wholesome food during the winter months.

This, joined to the artificial grasses, which yield plenty of green fodder by the latter end of April, or, at farthest, by the beginning of May, would serve to maintain numerous herds of cattle through the whole year.

Experience continually convinces us, that the farmers suffer great losses amongst their cattle, for want of fodder, when a dry spring happens to hin-

der the natural grafs from springing. They are then obliged often to fell at a low price the cattle which they are no longer able to feed. This is a fatal injury to their crops, as the quantity of dung must of necessity be decreased.

For these reasons, we cannot be too much attentive to sowing of artificial grasses, and raising such crops as will supply our cattle with plenty of food during the winter season.

To have numerous herds of cattle is certainly of great benefit to every kingdom; and indeed, if we would have large crops of corn, they are absolutely necessary.

Take care of your cattle, and agriculture will be sure to flourish in all its branches.



ARTICLE XIX.

The Description of a Siberian Tree, bearing a kind of Peas, and which is very proper to be recommended for Cultivation in the Northern Parts of Scotland. Written by M. DE GRAFFENREID, Lord of Worb in Switzerland, and Member of the Œconomical Society at Berne.

THIS TREE is known by the following names.

Robinia pedumentis simplicissimis, foliis abruptis pinnatis. Lin. Sp. et Gen. Plantar.

Asphalatus, Aman, Ruthen. 210. n. 285.

Caragana Siberica. Ray. Hort. Lugd. Bat. 537.

The leaves of this species of Robinia are conjugated, and composed of a number of small single folioles, of an oval figure, and ranged by pairs on one common stalk.

The flowers are legumenous, and are clustered on a filament.

a filament. Every flower consists of a small bell-shaped petal, cut into four segments at the edge, the upper part being rather the widest. The keel is small, open and rounded. The wings are large, oval, and a little raised. Within are ten stamina united at the base, curved toward the top, and rounded at the summit. In the midst of a sheath, formed by the filaments of the stamina, the pistil is perceivable, consisting of an oval germen, terminated by a kind of button. This germen becomes afterwards an oblong flattish curved pod, containing four or five seeds, of a size and shape irregular and unequal; yet in both respects somewhat resembling a lentil.

This Tree grows naturally in the severe climates of Northern Asia, in a sandy soil mixed with black light earth.

It is particularly found on the banks of great rivers as the Oby, the Jenisia, &c.

It is very rarely met with in the inhabited parts of the country, because cattle are very fond of its leaves, and hogs of its roots; and it is so hardy, that the severest winter does not affect it.

The celebrated botanist Gmelin found it the neighbourhood of Tobolsk, buried under fifteen feet of snow and ice, yet had it not suffered the least damage.

Its culture consists in being planted or sowed, in a lightish sandy soil, which must on no account have been lately manured.

It thrives best near a river, or on the edge of a brook or spring; but presently dies if planted in a marshy spot, where the water stagnates. If it is planted on a rich soil, well tilled, it will grow to the height of twenty feet, and in a very few years will be as big as a common birch tree.

In a very bad soil this Tree degenerates, and becomes a mere shrub: the leaves grow hard, and their
fine

fine bright green colour is changed to a dull deep green.

The Tongusian Tartars, and the inhabitants of the northern parts of Siberia, are very fond of the fruit of this tree, it being almost the only sort of pulse they eat.

M. Strahlemberg, author of a well-esteemed description of Siberia, assures us, that this fruit is tolerably good food, and very nourishing. These peas are first infused in boiling water, to take off a certain acrid taste they have, and are afterwards dressed like common peas, or Windsor beans; and being ground into meal, pretty good cakes are made of them.

The leaves and tender shoots of this tree make excellent fodder for several sorts of cattle. The roots being sweet and succulent, are very well adapted to fattening hogs; and the fruit is greedily eaten by all sorts of poultry. After several experiments somewhat similar to the methods used with Anil and Indigo, a fine blue colour was procured from its leaves.

The smaller kind of this tree *Robinia*, (Lin. Sp. et Gen. Plant. n. 5. or *Asphalatus minor*,) seems still better adapted to answer this purpose. The striking elegance of its foliage, joined to the pleasing yellow colour of its beautiful flowers, should, one would imagine, bring it into request for forming nosegays, or for speedily making an elegant hedge.

Besides the qualities above recited, it possesses the uncommon advantage of growing exceedingly quick, and of being easily transplanted.

I am acquainted with but few trees, which, like this, will within four or five years after it is sown, bear fruit in abundance; and which, in the same space of time, will grow fifteen feet in height, and five or six feet in circumference.

After

After all that has been said with respect to this useful tree, the culture of it cannot surely be enough recommended, particularly in cold mountainous countries.

There are large plantations of it now in Sweden, Norway, Lapland, and Iceland.

The celebrated Linnæus assures us, that, after the *Pinus fol. quinis*, erroneously named the Cedar tree of Siberia, this tree, of all that are to be found in Siberia, is most worthy of cultivation.

[The Translator is of opinion, that it may serve to illustrate this subject, if he lays before the reader the sentiments of the very accurate Mr. Miller, with respect to this plant, so much recommended in the above essay.

In his Gardener's Dictionary, edition 1759, under the article Robinia, he informs us, that the characters of this Genus of Plants are as follow.

“ The empalement of the flower is small, of one leaf, and divided into four parts; the three under segments being narrow, but the upper one is broad. The flower is of the pea bloom kind; the standard is large, roundish, obtuse, and spreads open. The two wings are oval, and have short appendixes which are obtuse. The keel is roundish, compressed, obtuse, and is extended the length of the wings. In the centre are situated ten stamina, nine of them being joined together, and the other standing single, terminated by roundish summits. It hath an oblong cylindrical germen, supporting a slender style, crowned by a hairy stigma; these are inclosed by the keel. The germen afterward becomes an oblong compressed pod, inclosing kidney-shaped seeds.

Our author observes, that this genus of plants is ranged in the third section of Linnæus's seventeenth class, which includes those plants whose flowers have ten stamina joined in two bodies; and that Tournefort places it in the third section of his twenty-second

second class, which contains the trees and shrubs with a butterfly flower, whose leaves are, for the most part, placed by pairs along the mid-rib.

We find that the plant described, by the foreign author, is Mr. Miller's tenth species of the Robinia, namely, *Robinia pedunculis simplicibus, foliis quaternatis petiolatis*. Hort. Ups. 212. Robinia, with single foot stalks, and leaves growing by fours upon foot stalks. This is the *Aspalathus frutescens major latifolius, cortice aureo*, Aur. Ruth. 283. Greater broad leaved shubby Aspalathus, with a golden bark.

It grows, he says, naturally in Siberia and Tartary, with a shrubby stalk eight or ten feet high, sending out several branches, which grow erect, and are covered with a smooth yellowish bark. The leaves have each two pair of oval pointed lobes, which stand upon short footstalks. The flowers are produced upon single footstalks, which come out at the joints of the branches; they are yellow, and shaped like those of the Laburnum (the first species of Miller's Cytifus) but are smaller. These appear in May, and if the plants stand in a moist soil, and shady situation, their pods will succeed the flowers, and the seeds will ripen the end of August.

This sort is propagated by seeds, which should be sown in a shady situation in autumn, and then the plants will come up the following spring; but if the seeds are sown in the spring, the plants seldom rise the same season. When the plants are come up, they will require no other care but to keep them clean from weeds till autumn, when, if the plants have made any progress, they should be transplanted on a north border, at about six inches distance, where they may grow two years, and then should be planted where they are to remain, which should be in a cool moist soil.]



ARTICLE XX.

The Culture of the great red Clover, as practised in Bretagne in France, being the Method recommended by M. le Baron DE PONTUAL.

CLOVER yields amazing large crops, and requires not as much care in its culture as the other artificial grasses; it is, besides, particularly well adapted to such lands as are suffered to lay idle for three or four years, after having borne several successive crops of corn.

These years of idleness may properly enough be termed years of barrenness; yet the peasants are unfortunately so far prejudiced in opinion, as to esteem them a resource for feeding their cattle. But this prejudice serves only to shew, how few natural pastures there are in the province; and of course, how necessary it is to cultivate those which are called artificial.

In countries where there is plenty of feed for cattle, green in spring, summer, and autumn, and dry in the winter, would fallows barely covered with weak, languishing, and often dangerous weeds, be esteemed a resource? These pastures, if they can be said to merit that name, are necessarily hurtful to cattle.

The leanness and want of spirit in our cattle, in most parts of the province, may, in a great measure, be ascribed to the want of a sufficient quantity of winter fodder, and the scarcity of feed on the fallows in summer. They vainly wander in search of a belly-full. Hunger, and the want of better feed, make them eat, indiscriminately, all the plants they meet

with, and of course some that are very pernicious in their natures.

It would, therefore, certainly be of great benefit to substitute, instead of this scanty feed, plants which are vigorous and nourishing.

Clover would answer this purpose effectually, and the culture of it is by no means difficult.

The land must be well plowed, and got into fine tilth. The seed may be sown in March, April, May, June, or July. Eight pounds will sow an acre of land.

On the same land, and at the same time may be sown, oats, barley, buck-wheat, or flax; the last, however, is to be preferred, because in pulling it, the earth is loosened, and a new mould raised about the roots of the clover.

The Clover seed should be mixed with double its quantity of sand or ashes, as it may by that means be sown with greater regularity, and there will also be a considerable saving in quantity.

A very light harrow, or a rake, will serve to cover the seed; if it lay too deep it would not come up at all.

Clover should be cut just as it begins to flower, except such as is intended to be saved for seed, which should be from the second cutting.

This plant will grow in all soils, but it thrives best in fresh land that is not too moist.

It lasts at least three years, and sometimes five.

It is much more advantageous to spend it green than dry. Cattle should be kept out of Clover lays, and the crop will be greatly enlarged if some rotten dung is laid on the field in the winter.

When the crops fall off they are broke up by the plough, and the farmer finds his land greatly improved.

Clover is of so much the greater advantage to the farmer, as it puts him to no other expence than the purchase of the seed, which is no great matter.

Clover

Clover thrives very well being sown with oats. M. le President de Montlac sowed some in this manner, in 1758, and had a prodigious crop of oats.

At harvest the Clover was very thick, and near two feet high.

The manure which the several crops of corn have left in the land, serves to bring the Clover forward. From these several circumstances it is plainly evident, that for only the cost of the seed the farmer may have a rich pasture, which he may cut at least twice, and frequently three and four times in a year; and even this small expence would be greatly reduced, was Clover as plentifully cultivated in the province as we could wish.

M. le Baron de Pontual, who has cultivated large quantities of Clover, and who wrote the above method, 3000 copies of which have been distributed, observes, that this food is apt to heat cattle, if they have not some other fodder given them with it. A Flemish farmer taught him a method of remedying this quality of Clover, and, at the same time, of making it go much farther.

In Flanders, where a considerable quantity of it is cultivated, they stack it in alternate layers, six or seven inches thick, with straw.

The Clover imparts a share of smell and taste to the straw, insomuch that oxen and horses will eat either with equal relish. By this means the straw becomes of the same value with the Clover, and keeps the cattle cool and in good order.

M. de la Chalotais, and M. de Nevel, planted Clover in rows, to see if this, like many other plants, might not that way be made to yield a larger crop. The experiment did not succeed, yet it might, in some sort, be deemed success, to discover that Clover, which thrives well sown it how you will, produces by far the most considerable crops when it is sown broad cast.



ARTICLE XXI.

Observations on the culture of Lucerne, as sown by several Members of the Society for promoting Agriculture, established by the States of Bretagne.

CLOVER thrives best, and yields the largest crops when sown broad-cast; but the contrary is found to be the case with respect to Lucerne.

M. de Chalotais caused some Lucerne to be sown broad cast; that part of it which was not overpowered by the weeds, and killed by unknown causes, came up very well, but the greatest part by far perished. Those plants which did come up would have also perished had they not been taken up and transplanted in rows. This method of culture revived them, and they yielded good crops of fodder.

M. de Laurencin, who is a great promoter of agriculture, has communicated to the Society his observations on the culture of Lucerne. He sowed it for ten years together, till at last he was almost tired, as his plants were continually choaked by the weeds.

About three years ago he made an experiment of sowing it in rows, far enough one from the other to admit a spade. A slight digging not much above two inches deep betwixt the rows, with this instrument, will, now and then repeated, destroy the weeds; and with this slight tillage, the Lucerne may be cut four or five times in a year.

But nothing is more decisive in favour of cultivating Lucerne in rows, than the experiments made in May 1758 by M. de la Chalotais, and M. de Montluc.

The seed came up very well, and in proper time; but

but it was scarcely out of the ground before excessive dry hot weather, unaccompanied with dews, so frequent at that season of the year, surprized the young plants and parched them so, that they were scarcely to be seen.

Notwithstanding this accident, which seemed so well adapted to destroy them, on the first rain that fell they made surprizing shoots.

M. de Montluc sowed another piece of ground with Lucerne the beginning of June, the weather being more favourable.

At the end of July both the first and second sowings of Lucerne were fit for cutting, being strong, succulent, well nourished, and two feet and a half in height.

The plants speedily made a second shoot, inso-much, that, by the end of October, they had got to the height of three feet.

These experiments justify M. Duhamel, in so strongly recommending the culture of this plant in rows. The great crops he mentions to have had, are sufficient recommendations of his method of culture; yet it will not be proper to make too hasty a decision respecting the best method of cultivating this plant.

The Lucerne which is cultivated about Paris is all sown broad cast. This method being most simple, and much the easiest comprehended by farmers, should be universally recommended, if we could lay down any certain rule for ensuring success, though the crops in this way are not so large, and much more seed is used.

It is in vain to attempt introducing amongst farmers the culture of Lucerne, if we do not prescribe it to them in some method they are accustomed to. Time and example may bring them to better methods when they see the advantages resulting from the practice of them to others.

To aim at once at perfection, would be effectually discouraging

discouraging all those who never think of rising above mediocrity.

To cultivate Lucerne in rows, the land must be well prepared, and deep plowed.

The seed should be sown in rows, distant three feet one from the other; a light plow is from time to time to be passed between the rows.

This culture destroys the weeds as fast as they make their appearance, prevents the earth in the intervals from hardening and binding, and always keeps it in such a loose state, as, giving a passage to the roots, causes the plants to yield prodigious crops.

After the first year, a considerable part of the plants in the rows is to be taken up, and they should be transplanted into a well-prepared field, in rows six inches asunder, [much better twelve inches] and the intervals should be from time to time plowed in the manner above described.

The farmer who is no able calculator regards all these particulars as so many sources of trouble and expence to him; he knows not, nay will not believe if it is told him, that these expences do not amount to a fourth or fifth part of the advantages and profit which result from them.

To propose to him a method seemingly so expensive, so complicated, and so much different from his usual practice, is enough to terrify him. Therefore, before we recommend this method to farmers it will be necessary to repeat the experiment of sowing it broad cast in strong land. It will be proper to examine whether the failure of success in the first trials may not be attributed to some hidden cause, which does not always affect such land.

It will also be proper to sow some Lucerne broad cast in lighter lands, in order to judge by the crops what soil is best adapted to it.

ARTICLE

ARTICLE XXII.

An Account of an Experiment of sowing Clover on Rye in the Spring; made by Mons. TSCHIEFFELI, Vice-president of the Œconomical Society at Berne.

IN the month of April last, I caused thirty pounds of red dutch Clover seed to be sown on a field, containing about four acres, which was under Rye. Though the soil of this field was naturally very good, tolerably deep, and of a moderate strength, yet I found, in the end, that it was more exhausted than I had imagined.

Besides, a fortnight's dry weather, which immediately succeeded the sowing, occasioned all my labour and expence to be thrown away: but one of my neighbours was much more fortunate.

This person, by my advice, made the same experiment on two acres of common field land, which had been well manured; and in the beginning of September, he made hay enough, to reimburse him all the expences he had been at; and next year he will probably have a much larger crop.

My neighbour had two advantages, of which I was destitute; his land being in better heart, and a fine rain falling as soon as he had spread his seed: On these two circumstances depends the success of Clover sown over Rye.

ARTICLE XXII.

An Experiment to try whether Lucerne and Dutch Clover will bear transplanting: made by the same Gentleman.

LAST May I was willing to know whether the above two foreign grasses would bear transplanting: In order to which I caused one thousand plants sown the preceding spring to be taken up.

The

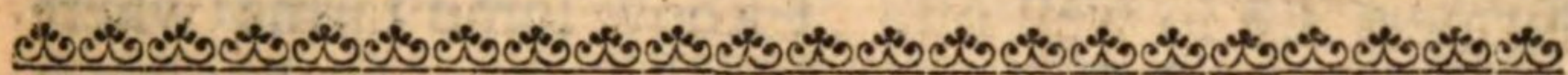
The roots were cleansed from the earth, and together with the heads, were shortened. The plants were then put into water, and afterwards planted in the same kind of soil they grew in, but pretty well tilled. Lastly, they were lightly covered with straw for a fortnight, to defend them from the heat.

Of these thousand plants, four at most died: all of them, and particularly the Lucern, made considerable shoots this summer, and according to all appearance they will continue to thrive: It will however, if possible, be necessary to lessen the expence of transplanting, which at first goes on but slowly, by discovering some method in which a woman might remove in a day about 2000 plants. This I think might be done with the help of an instrument like a rake, having iron teeth, thick, and long, set in parallel to the handle. This is to be pressed into the ground, by bearing the foot upon the head in which the teeth are fixed. If the plants were to be four inches asunder, there would be six holes, provided the head was two feet in length.

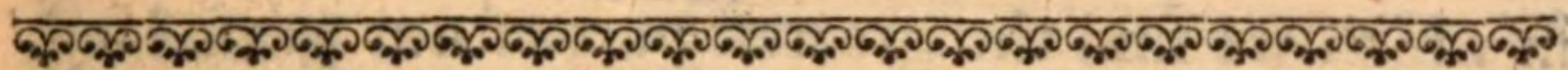
If this could be done, judging by the experience I have had, I should imagine the method of transplanting might to great advantage be adopted. In my opinion, the best way would be to plant them in rows, a foot distant, and six inches asunder in the rows. I am apt to think, that in this way, an acre of land would yield twice the quantity it would otherwise do: besides, a piece thus planted with Lucerne, would, in the second year produce a full crop, with the greatest probability of it's preserving this flourishing state for many years.



FOREIGN ESSAYS, &c.



N U M B E R III.



A R T I C L E XXIV.

An Essay on the best method of improving old worn-out Pastures by Plowing. Written by M. TSCHIFFELI, Vice President of the Œconomical Society at Berne in Switzerland.

A GREAT plenty of fodder for the use of cattle, undoubtedly forms the basis of a profitable husbandry, in climates such as that we live in, (Switzerland.)

The natural coldness of great part of our corn land, and the dryness and barrenness of much of the rest, require vast quantities of manure. The hardness of the soil, which is almost general, requires also a strong team to do the necessary plowing work.

How are we to supply these several wants without proportionable quantities of fodder? Besides the Pastures furnishing Switzerland with the means of breeding such considerable herds of cattle, which are with us so capital an article of exportation, we ought to omit no opportunity of improving them; on the contrary, our daily endeavours should tend to make them yield more abundant crops. The

NUMB. III.

Y

larger

larger our crops of this kind are, from the same extent of land, the more land shall we have left to us for the purposes of tillage; and as the quantity of our manure will be in proportion encreased, we may expect that our crops of corn will be considerably more plentiful.

At present they reckon that a good farm should contain at least as many acres of Pasture as of land in tillage; but it is very certain, that few of our farmers are so well off. I know some farms where the grass land does not amount to a sixth part so much as the plowed land: yet after all, in the state in which we find the greatest part of our grass land, half is not enough, there should be at least two thirds, to furnish us with dung to manure the plowed land properly.

This may easily be made to appear.

Suppose I possess thirty acres of land in Tillage, and thirty acres of Pasture. Of my lands in Tillage ten acres will be fallow, ten more will be under wheat or bere, and the other ten will be sown with either rye or spring corn; this is the constant course of our common field land, which is subject to commonage.

The next feed time then I should dung my ten acres of fallow, in order to sow wheat; for without the help of manure, I cannot expect even a middling crop.

We well know by experience, that ten load of dung, each load containing fifty bushels, is but an indifferent dressing.

If the dung should not be well rotted, it is always necessary to increase the quantity, but even then it is not so good as what is well rotted.

Moderately speaking then, we shall have occasion for one hundred loads of good dung, but will my thirty acres of pasture furnish me with this quantity?

An acre of common pasture will not, at a medium,
generally

generally yield more than a load of hay in a year, unless it is from time to time manured, or carefully flooded with good water.

Low meadow lands, it is true, will yield a larger quantity, but then the hay is not so nourishing, nor will it go so far; besides, the dung it produces is not so good.

If then we allow to every load of hay two loads of straw for litter, we shall at the most receive but three loads of rotten dung in return. Thus, from my thirty acres of pasture I get ninety loads of dung, which I find to be ten loads less than I have occasion for to lay on my fallows, allowing none for my kitchen garden, my hemp and flax grounds, and other crops to which dung is absolutely necessary, and which a farmer cannot do without.

It must not appear surprizing that in many parts of this country, particularly near the large towns, a system of farming has been of late years adopted, in those lands especially which are not subjected to the rights of commonage, in which all the arable land is made to bear alternately corn and grafs; care being taken that two thirds of the land be always down in pasture.

In every part where this wise method has been adopted, the lands have doubled their crops, and of course their value.

I thought it necessary to say so much, for the benefit of such of my countrymen as might not be acquainted with this method.

There are too things which should principally induce a farmer to break up or plow a part of his pastures; the high price of wheat, which makes its culture more profitable than ordinary, or the pasture's falling off in its produce.

The first of these causes being accidental, and a matter of speculation, I shall not in this place enlarge on it.

The second will of course be the case with all upland pastures; as to the low meadows, they cannot without draining be plowed; and there are but few pastures which enjoy the singular advantage of being flooded with good water at proper times.

The plants generally met with in our ordinary pastures, as nearly as I can remember, now the severity of the weather has made them disappear, are wild Ranunculas, Alchimilla, Daisies, Cranesbill, Betony, Bugloss, wild Marjoram, Sorrel, Chervil, Cummin, wild Parsneps, wild Mint, broad and narrow leaved Plantane, wild Burnet, Cowslip, Yarrow, Shepherd's Pouch, Camomile, Pimpernel, and lastly all the several kinds of Cow Grass and Trefoils.

The best of these plants are such as are well furnished at bottom with sweet leaves, and have stalks which do not grow too hard in drying.

Such are the Trefoils, Alchemilla, narrow leaved Plantane, &c. As our Aftermaths consist for the most part of these sorts of plants, the larger, hard, and less succulent plants not abounding so much in them; the second crops of our grasses, though much inferior in quantity, are greatly superior in quality to the first; which remarkable difference distinguishes our Aftermaths from those of any other part of Europe.

The plants of a middling quality are those which in haying easily lose their small leaves, scarcely any thing but stalks being left; such as Cranesbil, Chervil, Cummin, Sorrel, wild Parsnep, and the several sorts of Cow Grass.

The worst plants are those which send forth hard stalks, affording very little nourishment, such as Chamomile, Bear's Foot, Shepherd's Pouch and Yarrow. If cattle are not very hungry they will not eat these in the stable.

To these plants we may add the broad leaved
Plantane

Plantane; its broad leaves laying close to the surface of the earth, are not only out of the reach of the scythe, but they also prevent all other plants from growing under them.

I scarcely know any greater evil that can infest our good pastures. As soon as ever it appears, its progress is really every year astonishing; and there is no other method of destroying it, but by putting the plow into the field.

Another enemy to our pastures, particularly those which lay high and dry, is moss. It no sooner begins to get a head but the grass is in the same proportion diminished in quantity. Nothing but the plow, or hot manures, such as turf ashes, foot, urine, and human ordure, can ever remedy it; shade is a great friend to its growth.

Suppose even that neither the plantane nor moss infests our grass lands, yet will they in a length of time, by degrees, of themselves fall off, on account of the prodigious quantity of roots of plants which continually increase in them.

In the end these roots become so interwoven, that they form a close coat or covering to the land, the turf being stretched, and smooth like the skin on a drum; in fact, the field becomes so much hide-bound, that the earth underneath is absolutely precluded from receiving any benefit from the air, rains, or even manures.

From this time vegetation languishes, and at the end of a few years the finest piece of grass land becomes only a poor lean worn-out pasture, where the wretched cattle are forced to wander from spot to spot in search of a miserable pittance.

As soon therefore as our grass lands fall off in their crops, be it from what cause it may, we endeavour to remedy it by plowing. This is generally our resource every sixth or eighth year; few of our grass lands will hold out longer without this assistance.

The

The first thing we do is to examine the nature of the soil. If it is but shallow, and is at the same time light and dry, a single plowing, such as I shall just now describe, is sufficient to bring it again into full bearing; but in other cases of a contrary nature, the operation must be repeated the year following.

About the end of September we spread on a worn-out Pasture about ten loads of good dung *per acre*, which we turn in, together with the turf, as deep as the soil will permit, with the common plow.

Along the furrow we place as many hands as may be necessary to break the clods before the next bout of the plow covers them.

In order to do this work as it should be, it will be necessary to have six or eight people to each plow. Each person is provided with a light spade, but very sharp; and if they work as they ought to do, there will very few clods remain bigger than the fist.

When this work is done, the field is sown with Bere, the quantity of seed being proportioned to the nature of the soil, and the quantity of manure that has been used; that is to say, the richer the land is, the less seed it will require.

After the seed is well covered with the harrow, the careful and diligent farmer passes a heavy roller over the field, but this must never be done except the weather is dry, lest it should knead the land too close.

Rolling is of great service in defending the roots of the bere from the severity of the winter frosts; and it also makes the land so level, that when it is afterwards laid down to grass it is much easier to mow.

The spring following, if it is not proposed to weed the bere, it will be of great service, if just before it begins to branch, a large bush harrow is drawn over the field. Some may perhaps imagine this will be but of little service, yet by scratching the surface of the earth, and raising a mould, it is
certainly

certainly of great benefit to the crop, by giving it strength and vigour.

I deny not but that weeding would in many respects be of more advantage, but this work being expensive, few farmers can afford to do it in any extent.

Weeding does not at all lessen the future crops of grafs, when the field comes to be again laid down. This work being never so neatly and exactly done as in a garden, or even hemp ground, the weeders attending only to the larger plants, the destruction chiefly falls on the thistles of all kinds, the blew bottles, orache, bind weed, poppies, and other trash of that nature, as hurtful to the grafs if they infest it, as to the corn, from which we would banish them.

When the bere is harvested, if it is a light shallow earth, the work is done; it is also necessary to keep all cattle out of the field, and when it is harrowed, the following spring with a pair of drags, to kill the large weeds, the farmer will soon have the pleasure of seeing the surface covered with a beautiful turf, as agreeable to behold as it is useful for the food of cattle.

If, on the contrary, the soil of the field should be deep and heavy, the same operation is in all points to be repeated; observing only, if possible, that the dung for the second crop of bere is not so much rotted as was the first. The quantity of grafs seeds of all kinds still capable of vegetating, which this dung contains, will not a little contribute to form your turf the following year.

If the farmer, some weeks after the bere is off the land, or in the following spring, should perceive any spots bare, he will do well to sow there some hay seeds, which fall in plenty when they shake it before they give it to the cattle.

In order to preserve this field in good condition, I shall only make one remark; which is, that it should

should never be watered or flooded the first year, particularly if the soil is light, and the field lays on a slope. The earth being loose, and not well settled, the roots of the best plants would by such watering be laid bare and injured.

It is no easy matter to account whence proceeds so suddenly that immense quantity of plants, which we see cover our land the second year after it has been managed in this manner. Undoubtedly the fibres of the roots of some plants still preserve life in them, notwithstanding the field has been so often disturbed. Much seed is also carried on with the dung. The wind also may bear many of the winged seeds from the neighbouring lands.

But that which appears to me most probable is, that many seeds are found under the old turf, which, though they had not room to grow, possessed the peculiar quality of being preserved in that state for a number of years without rotting.

The earth being afterwards broke, loosened and mended, I conceive that all those seeds which are not buried too deep come up; and that such as fall to the bottom of the furrow, and are covered too deep for the air to affect them, remain in that state unhurt, and wait only for some future opportunity of being brought towards the surface to vegetate and grow.

It may not be amiss, before I conclude, to give some reason why in this method of husbandry I prefer bere to all other grain.

Dung being very dear with us, it is natural to think we should prefer that crop which will yield us the largest return, without damage to our principal view, which is laying the field again down to grass.

Wheat, though in itself a more valuable crop, is not yet so proper for our purpose. To succeed well, it requires at least three or four good plowings in lands
that

that have a strong turf. This would of course deprive us of our last crops of hay and the aftermath; and there is also a great probability that these successive plowings would be injurious to our future intended pasture. Plowing destroys the seeds of grass, therefore they cannot be proper to promote its vegetation.

Oats do not thrive well except on high grounds, without the assistance of dung they would only impoverish the land, which required to be amended; and in land that is well dunged, they run away all to straw.

A crop of rye is not worth above half as much as a crop of bere, and barley is by no means adapted to our intended purpose; so that after all, I, without the least hesitation assert, that bere, of all grains, is the best adapted to the improving of old worn-out Pastures.



ARTICLE XXV.

To the AUTHORS *of the* Foreign Essays on Agriculture and Arts.

Gentlemen,

VARIOUS have been the opinions respecting the nourishment extracted by plants from the earth; some asserting that all plants require the same food, and that there is only one nutritive juice which equally serves for them all, being secreted, modified and adapted to the nature of each plant by means of certain organs contained in its structure.

Others, on the contrary, say, that every plant requires a particular food, and that when one plant has extracted from the earth all the nourishment it

No. 3.

Z

requires

requires, and which is adapted to its nature, the ground is not the less proper for affording nourishment and support to some other plant of a different genus.

I do not by any means pretend to judge which of these opinions is most reconcilable to nature and reason, tho' I have been long a practicable husbandman in one of our North American Plantations: the truth is, these are enquiries which do not immediately attract the attention of the farmer, and it is only since I have been retired from business, and settled in this Metropolis, that I have at all attended to such researches, which, though curious, have yet their use.

As you invite Gentlemen to correspond with you, and send you pieces for insertion, I have taken the liberty of recommending to your notice a piece written on this subject by the celebrated Mons. du Hamel; and shall next month, if you approve of it, send you a most curious piece on the same subject, written by Mr. Engel of Switzerland. I shall not at present take up more of your time, except to assure you that I am a well-wisher to your work, and, Gentlemen, your very humble servant.

London, March 2, 1765.

R. BRENNAN.

An Essay on the question Whether the several Kinds of Plants require the same Nourishment; by Monsieur DU HAMEL.

TO take this matter in a general sense, it does not seem probable that the same matter can supply such a number of plants, differing one from the other in appearance, in form, smell, taste, and even in their properties, with food: for it is not to be doubted but the internal parts of plants differ much one from the other.

But

But we must not thence conclude that the nutritive juices differ whilst in the earth, previous to their being modified by the organs of the plants. In reflecting that plants rob one another of nourishment, by means of the roots they extend in the earth, we are under a necessity of admitting that the first nutritive juices are homogeneous.

It might indeed be urged, that as water enters largely into the composition of the sap proper for all plants; and as it is, at least, a vehicle necessary to dissolve the other constituent parts of the sap: this vehicle, necessary to all plants, being absorbed by some plants, those remaining, must, of course, suffer, as the other constituent parts of the sap could not any longer be divided and dissolved as much as was necessary, to enable them to enter these plants. But something yet more explanatory may be added; if, for instance, a Lettuce required any different food from that which supplies Endive with nourishment, this Lettuce planted with Endive would thrive better than if planted among other Lettuces; however, experience convinces us to the contrary. It is then certain that plants of different kinds rob each other of their food; and it seems as if this extended farther than the aqueous vehicle; besides, it can be made appear, that the same juice, imbibed by different plants, assumes various qualities. For instance, having taken a Lemon of the size of a pea, and grafted it by the stalk on the branch of an Orange-tree, it there throve, ripened, and still preserved its quality of a Lemon, without partaking in any thing of the Orange: this incontestably proves, that the juices of the Orange-tree received a different modification on entering into the organs of the Lemon. All grafts prove the same thing.

Not content with thinking there were different saps for the nourishment of every plant, some would have it, that there were in every sap particular juices

to form every part of the same plant, or the same fruit. What a difference is there betwixt the flesh of a Peach, the shell of its stone, the substance of its kernel, &c. ? It was, therefore, thought necessary, that it should have as many particular and distinct juices for the nourishment of each part.

It seems to me very probable, that the organs of plants so modify the sap as to give a different flavor to fruits, and form the different parts of the same fruit ; for with ever so much attention, no traces can be found either of the flavour or the smell of a root, in the earth that surrounds it ; and in chewing the leaves and young branches, there is often perceived a total want of any thing analagous to the flavour, or the smell of their juicy and aromatic fruits.

Should any one ask me how the same sap can serve for the formation and nourishment of the shell of the stone, the skin of the kernel, and the flesh of a Peach, I would, in return, ask the most able Anatomist, how the chyle, which is the sap of animals, can form the substance of the brain, the nerves, the membranes, the flesh, the bones, the nails, &c. These operations depend on a mechanism so refined and delicate, that it has escaped the researches of the most celebrated Naturalists.

Mariotte imagined, that in plants, this operation was performed in the roots ; but by grafts, and many other observations, it is fully proved, that the organs capable of giving a modification to the sap, exist in all the parts of plants ; and if we sometimes meet with imperfect Peaches, which taste of the leaves of the tree, it is most natural to attribute it to a depravity of the organs destined to give a new preparation of the sap which was to enter the fruit.

It is true, that particular tastes are found in fruits, which seem to proceed from the earth in which the trees are planted, and which, on that account is called

led the taste of the soil; but these tastes, peculiar to certain soils, are equally met with in all the different kinds of fruit which grew in that same soil. Thence, I conclude, that there are certain juices, the taste of which is not to be altered by the organs of vegetables; but this observation proves, that they are indifferently infectious to different plants, and that they mix with the nutritive juice, still preserving something of their original character.

The same thing is observable in the animal kingdom. I have eat, at the late M. de Reaumur's, Chickens, the flesh of which smelt of Garlick; because they had mixed that plant with their food. In like manner, a Rabbet, which had been fed at M. de Malesherbe's with nothing but Sage had its flesh strongly scented with the odour of that plant.

We may add, that Madder, mixed with the food of different animals, renders the bones, that are formed in the time it is used, of a very beautiful red colour. But these exceptions should be no obstacle to our concluding, in general, that aliments change their nature in the internal parts of animals and vegetables; to form in the last, wood, bark, and the substance of fruits, &c. and in animals, flesh, tendons, bones, &c.

It is true, we cannot boast of having a perfect knowledge of any part of vegetables; but Grew, Malpighi, myself, and, I venture to say, all the Naturalists, have found on the surface of the roots only a spongy substance, which seemed indifferently disposed to imbibe every kind of juice which presented itself.

If this is the fact, the juices must receive their qualities in the internal parts of plants; and what makes this opinion the more probable is, that I have raised in very clear, and very pure water, Capillary plants, bulbs of flowers, different kinds of Pulse, and even trees; these plants have found, in this
very

very pure water, wherewithal to furnish themselves with the lively smell of Balm, the sweet taste of the Bean, the acrimony of the Oak, the bitterness of the Almond, and the viscosity of the buds of the Horse Chesnut-tree; and, by a chemical analysis, these plants yielded the same extracts as those that were raised in the earth.

Tho' the knowledge we have of the mouths of the pores of roots is very contracted, yet it is possible to prove, that these roots indifferently imbibe juices of very opposite qualities. By a chemical analysis, nitrous salts, vitriolic salts, and sea-salt, are extracted from plants. It is not at all probable these three mineral acids should have been formed in the plants.

I have, besides, put the roots only, of young plants, into tinged or scented liquids, and have met with manifest traces of these liquids, even in the leaves and fruit. Some have also been of opinion that every thing capable of being dissolved by water, indifferently finds a passage into plants; and this, with a few restrictions, may be admitted. But they have farther imagined, that each plant appropriated to its use only such parts as were proper for its nourishment, the rest passing off by transpiration: it is this point that cannot be allowed; for all that have examined the transpiration of plants, could perceive nothing in it but a pure phlegmatic matter.

It is necessary to remark, that, by admitting plants only to appropriate to themselves what is necessary, it would of course follow, that the earth would be as much impoverished, as if all plants were fed with the same juice; for, as the transpiration mingles with the air, and is dispersed at large, it cannot well be said to fall again on the earth, which produced it, and that this earth is fertilized by it.

An objection might be made to the identity of the nutritive juices of plants, by remarking, that
certain

certain soils seem more proper than others for the growth of certain kinds of plants: one soil is proper for rye, another for wheat, this for meadows, that for artificial pastures, &c. and the reason for this conclusion is, because the nutritive juices of these plants are found there in greater plenty than elsewhere. I do not controvert this observation; but does this depend on the nature of the juices contained in the earth? or, may it not be attributed to another cause?

To oppose one observation to another, I shall remark that, in all appearance, the same earth can afford nourishment to every kind of plant. Thyme, which commonly likes a dry soil, will thrive, if planted in the earth of a marsh carried to the top of a hill; in like manner, a tuft of rushes will thrive in earth taken from the same hill, provided it is carried into a marsh. It does not then, in this case, proceed from the nature of the earth that thyme grows naturally on the hill, and the rush in the marsh; but because the rush requires more water than the thyme, which would perish in too moist a soil.

This may be carried farther. Botanists know that all plants, not only of our Temperate Zone, but also of the Frigid and Torrid Zones, live in the earth of our climate, provided they are so situated as to enjoy a degree of heat and moisture suited to their constitution. This being premised, good earth appears to agree with all vegetables; and, in fact, the plants we meet with in a bad soil, grow with an uncommon vigour, when found in fertile land.

We may add, that plants which bear largely, have occasion for a greater depth of good earth. That which is only six inches deep, may afford nourishment to plants whose roots extend not very far in the earth, such as almost all annuals. But this depth
of

of earth will not be capable of affording sufficient nourishment to Lucerne, much less to trees.

This, and other the like circumstances, may be the cause that certain plants thrive better in certain soils than others, without attributing it to any essential influence which can proceed from the nature of the juices contained in the earth.

In order to support the heterogeneity of the nutritive juices of different plants, it is farther remarked that, if a tree dies, in any spot, of age, another tree of the same kind being planted there, seldom succeeds; and that it is more proper to plant a tree of a different kind; because, say they, the earth is exhausted of the juices proper for the sort of tree that died of age; but contains others proper for the nourishment of trees of a different species.

I allow that the difference of the nutritive juices furnishes a very natural explanation to this observation; nevertheless, many other causes might be assigned. The tree which is supposed to die of age, may have died thro' some particular default of the soil, by means of some insect's having destroyed its roots; or, perhaps, of a decay, caused by its being drained of its sap by some parasite plant, which has secretly robbed it: it may even turn out, that the rotting of the roots of this old tree, or certain secretions which the earth may have imbibed, have rendered this soil unfavourable to that species of tree only.

But to continue our relation of the facts, which seem to favour the heterogeneity of the nutritive juices of plants. All farmers agree in thinking that it is best to sow successively in the same land different feeds; such as wheat, barley, oats, peas, millet, turneps, &c. by this change, they can have successive crops from the same land, which they could not have if they always cultivated the same kind of grain.

After

After being convinced of this fact, I shall remark, that if barley succeeded well after wheat, only because the earth had retained the kind of juice proper for the nourishment of barley, it would follow, that a good crop of wheat sown on a barley-stubble might be expected, as the barley would not have devoured the juices proper for the wheat. Nevertheless, the crop of wheat would, for the most part, be bad; because wheat does not succeed, unless the land has been prepared by three or four good plowings: on the contrary, barley, which is less delicate, and requires not so much nourishment, succeeds tolerably well in a field that has had but two plowings. But this barley would give most amazing crops, if sown on land prepared as for wheat.

It may be added, that if every plant only drew from land the juices adapted to its species, the year of fallow might be omitted, and the first year wheat might be sown, the second barley, the third oats, then buck-wheat, peas, maize, millet, &c. It must be allowed that by this method, continued without interruption for a number of years, but very weak crops would be got, the year of fallow being necessary to give the land the plowings requisite to divide its parts and kill the weeds.

Another observation is made to prove, that plants of different kinds require not the same nutritive juice, which is, that a poor land left untilld, and suffered to cover itself with grass, at the end of a few years so far recovers itself as to be in a condition of yielding tolerable crops. In like manner, good crops are had from either natural or artificial pastures, newly broke up, without the help of manures. These lands, say they, instead of being exhausted by the grass they produced, resemble fresh earth.

If corn succeeds well in pastures broke up, it is probably because the grass, being nourished by the

surface of the land only, the inferior earth remains unimpoverished, being even meliorated by the rotted leaves and roots. Saintfoin and Lucerne should be excepted from this rule, as they push their roots far into land; and, perhaps, as they seek their food at a great depth, they do not exhaust the surface. On the contrary, they enrich the land by their leaves, which rot; and this enriched surface is sufficient for the growth of annual plants.

The most natural conclusion to be drawn from these observations, is, that plants do not render the earth barren, and that they never injure each other, unless it is during their growth; and if they do it then, it is, perhaps, by consuming the moisture, which is the chief vehicle of their nourishment. It is, probably, on this account that trees are killed when Saintfoin is sown on the land in which they extend their roots.

We may say, with Mariotte, that the principles of which every plant is composed, are the same, at least with respect to such principles, as are most obvious to our senses. If they have others peculiar to each plant, it is not in our power to separate and demonstrate them apart.

To prove this proposition by an experiment: Take a garden-pot with seven or eight pounds of earth in it, and sow therein any plant you please, it will find in this earth, and the rain-water used to water it, all the principles proper for its nourishment. When it has attained its full growth, let the earth of the pot be stirred, and sow another kind of plant, watering with rain-water as you did the first, and it will thrive; and in this same earth you may raise as many roots of plants as you please. But if the salts, oils, earths, &c. of every one of these kinds differed from each other, it would be necessary that all these principles should exist in this small quantity of earth, and the rain-water used to water it;

it; yet this is impossible. For tho' each of the plants raised in the pot should yield but one drachm of fixed salt, two drachms of earth, &c. all these principles, mixed with their distilled water and their oil, would weigh at least two or three ounces; which, being multiplied by the number of the plants supposed to be successively raised in the earth of this pot, would amount to much more than the weight of the earth in the pot.

After the experiments and observations I have related, I must forbear making any positive conclusion on the nature of the nutritive juice of plants; and, notwithstanding the success of my experiments on the vegetation of plants in pure water, I am apt to think, with Mariotte, that the juices imbibed by plants are not so pure a water as that which I employed. It may, perhaps, be the same with regard to these plants as with certain fishes, which live for a long time in the most pure water, but grow thin, and would in the end die if other food was not given them. Our experiments will, at least, undeceive such as think this vegetative virtue depends on a pretended nitre, which many authors have taken occasion to mention.

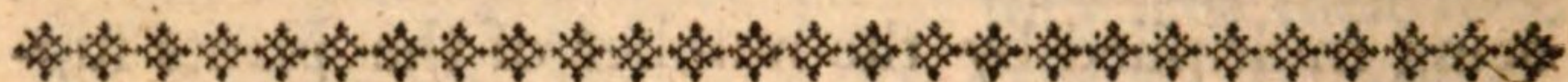
With respect to the preparation liquids receive in the internal parts of plants, there is not the least doubt but they depend on so refined a mechanism, that it has hitherto escaped our researches. Neither is this matter of surprize, since the same question, with respect to animals, remains as yet undecided, notwithstanding the researches of the most celebrated Anatomists.

What we have said relative to the nutritive juice of plants, may induce us to be of opinion.

I. That many plants of different kinds are fed by nearly the same substance.

II. That there is no plant but what robs of food all within its reach.

III. That a soil once adapted to one kind of plan will always be in a condition to supply it with food, provided it is properly cultivated.



ARTICLE XXVI.

*An Essay on the Construction of Highways; by M.
FR. L. HALDIMAND, Secretary to the Bailiwick of
Yverdon in Switzerland.*

AMONGST all the monuments we have of the grandeur of the Romans, none are greater testimonies of their power and wisdom than the Highways which remain of their construction.

The fall of that vast Empire occasioned Sciences and Arts to decline; every thing bore the character of the Barbarians who made the conquest, and the most deplorable ignorance seemed for several ages to have banished reason and taste; every thing drooped in those unhappy times, industry and commerce were neglected, and the magnificent Highways were suffered to go to ruin.

It was necessarily a work of many centuries to dissipate the cloud which obscured human reason, and to restore a taste for Sciences and Arts to men who were barbarized by ignorance, prejudice and superstition.

In our age, however, this point seems to be gained, and to its honour it may be said, that being at least equal to Greece and Rome in their most splendid times, it surpasses them in a taste for every thing that can contribute to the good of mankind.

This is the end proposed by the numerous Societies which have been formed, and this is in particular

ticular the plan laid down by the illustrious Œconomical Society of Berne.

For this same end, having maturely considered the many blunders made by ignorant surveyors on our public roads, I thought it incumbent on me to write an Essay on this subject.

Every thing I say is founded on a long experience, and may be of some use to those who, not having this experience, may be called to superintend such works. I have been very particular, some may perhaps think too much so, but having nothing in view but the good of my country, I imagined every thing essential which could in any sort promote it.

I divide this Essay into two parts, the first treating of the manner of making Roads, and the second of keeping them in repair; to which I shall add a few remarks on their utility, and the advantages which result from making them.

PART *the* FIRST.

Of the Construction of Highways.

A knowledge of the true principles is indispensably necessary in every art; and that of making great Roads requires, as much as any other, some preliminary pieces of knowledge very necessary in a superintendant or surveyor. A beaten tract of knowledge is but a bad guide in cases which very frequently happen, where, amongst several ways, the best is to be preferred.

Integrity in a surveyor is not less essential than activity; he should merit the confidence of his employer, and be continually attentive to whatever is committed to his care.

A surveyor, after laying out the road, should, himself, in the best manner distribute the workmen, by dividing them into separate bodies, to avoid confusion.

sion. He should often visit the works, and particularly at the end of every week, at which time he should receive and settle the lists of every overseer, in order to pay him the amount, which this last is to distribute to the workmen.

They should make choice of particular overseers. A proper knowledge of their business, honesty, activity, and punctuallity, qualities they are supposed to possess, should alone influence the surveyor in his choice.

He should furnish every overseer with clear, precise, and plain orders, and not puzzle him with too great a number of workmen, that he may the better see that they do their duty.

One essential duty of every overseer is never to leave the workmen, and he should call them over three times a day, morning, noon and night, and he should admit of no parts of a day less than one half.

The overseer should without favour or partiality, acquaint the surveyor if he has under his care any lazy or mutinous workmen, that they may be discharged, for fear of giving a bad example to the others.

The hours of work should be regulated by the surveyor, according to the season of the year, and the nature of the work: he should also fix the price of the carriage, regard being had to distance and to the strength of the team, for such as are to be paid by the journey.

The materials for making drains, for bricklayers or mason's work, and bringing turf, being the only articles which will require unequal loads, the carriage of them should be paid for by the day. Every thing else is to be paid for by the journey, and every journey the overseer is to deliver a tally, which is to be notched at the corner if the carriage is not properly loaded, in this case it is to be paid for only as half a load.

The overseer should every night take up all the
tallies

tallies given out in the day, in order to charge them in his book; and if he is obliged on any account to be absent, he is not to trust the giving out or taking up of these tallies to any but a workman pitched on for that purpose by the surveyor.

The workmen should find their own shovels and pick-axes, but if there should be occasion for any other tools, they ought to be found out of the public money, and committed to the care of the overseers.

The first thing to be done in a Road of any extent is to lay down a plan of it, in order to its being made straight. If, in laying down this plan, there should be any considerable ascents or descents, they must be noted on the plan, distinguishing such as are most steep, that they may be helped when the work comes to be executed.

The surveyor must not be afraid of working in new land, whether to shorten the road, or to avoid filling up hollow ways, as the purchase of the ground will be but a trifle, and a considerable saving often ensues; and besides, some advantage may be made of the old road, either by selling it or changing it with the proprietors of the neighbouring lands.

The width of roads is various, according to their destination, the largest Roads in this country (Switzerland) having twenty-four feet for carriages, three feet on each side for banks, and the same for ditches, amounting in the whole to thirty-six feet: the less public Roads are about thirty feet wide, and the cross Roads about twenty feet in the whole. A greater width would incroach too much on the arable land, and would be too chargeable both to make and keep in repair; however it must be observed, that near towns, pleasure and convenience should go hand in hand, and the roads should be wider and perfectly well kept in order.

If the Road is to cross a wood, it will be proper
to

to make it at least sixty feet wide, as well for the greater security of the traveller as to make the Road more airy.

The banks, which are between the ditches and the Road, are very necessary to prevent the materials of which the Road is made from falling into the ditches; they should never be less than two feet wide, and if three feet, it will be still better, and these banks ought to be sloping towards the ditches.

The ditches are very necessary for receiving and carrying off the water; the most suitable width for them is three feet, as to the depth, it must depend on the nature of the ground and other circumstances: when the ground lays low, and is moist, the ditches must be made wide and deep, to have wherewithal to raise the Road; in such cases, to prevent the bank from mouldring, it will be proper to turf the sides, which is better than brick-work, as the water will drain through it. In some places the ditches may be made very shallow, and in others there need be none at all; this will appear at first view, and should not be neglected by the surveyor, as it will be a means of saving much expence.

It is absolutely necessary that the upper ditch should frequently discharge its contents into the lowest, for which purpose a vent must be procured, and this may be effected two ways; one is by means of drains which go under the road, which should, if possible, always be made of brick or stone-work, and so large that, if they should chance by any accident to be stopped up, a boy may go in to clear them; the bottom particularly should be well paved: the other way, when the ditches are not deep, is to cause this water to cross the road running over it, a slope being for that purpose made.

It is absolutely necessary that a Road should be highest in the middle, but it should not be too high, because in this case the carriages will only go in the middle

middle for fear of overturning, or of sliding down when the snow is hard, and when all parts of the Road are not equally used, the natural consequence must be deep ruts: so that upon the whole it seems that a rise of one foot in the middle, when the Road is twenty-four feet wide, and well settled, will be sufficient, and other widths in proportion.

After having made these preliminary observations, I now come to the method of constructing public Roads.

I. The first thing to be done is diligently to survey two or three times the country where the Road is to be made, in order to be a judge of its situation; and to mark out the ground with parallel stakes, of a proper width, laying out the Road as straight as possible, provided too great an expence is not thereby incurred.

The ditches are then to be opened, and the earth which is thrown out of them is to form the banks on the sides of the Road, and not to be thrown into the middle as some recommend, in order as well to begin the rise the Road is to have in the middle, as to prevent the water from settling there; but these two prejudices are to be removed in an instant. With regard to the first, the solidity of the Road depends on the quantity of materials that are laid on it, and experience confirms it to us, that these should be to the depth of two feet and a half, or three feet; now, if the foundation on which these materials are laid, are rounded in the middle, it is easy to conceive that the Road would have too great a rise, and the consequences already mentioned would ensue. As to the second, when the road is once settled it is impossible the rains should ever penetrate through it, for what water does not drain into the ditches will soon be exhaled by the sun and winds.

In some places they are at considerable expences

to procure large stones for the borders of the Road, to prevent the materials of which it is made from spreading; but experience has proved this to be quite unnecessary, as we see no Roads hurt for want of these stone borders; and common sense will easily convince us that irregular shaped stones, loaded with the considerable weight of those above them, and fixed in their places by the fine gravel and earth which fill up the interstices betwixt them, the lower stones being firmly fixed in their beds by the weight of the whole Road, cannot certainly spread or give way by the (comparatively speaking) slight impulsion of waggon wheels.

The largest stones should be laid at the bottom of the Road, regularly disposed, yet not with too much nicety; then the smaller stones are to be laid over them, and being brought nearly to a level, about a foot depth of gravel should cover the whole; the small particles of this gravel being carried down by the rains, and the joltings of the carriages, get into the void spaces betwixt the stones, and the whole becomes bound in one solid body; but as the gravel is by this means lessened in quantity, some time afterwards, when it has been settled a little by the carriages, it will not be amiss to lay on another bed of it, and if there should be occasion, a third. When the work is so far advanced, it will be necessary to have a person constantly employed to fill up the ruts, and cast up the gravel into the middle of the Road till it is thoroughly well bound, and has acquired a proper consistence.

In order to do this work as it should be, it will require between thirty and forty loads of stones and gravel to make ten feet running measure, twenty-four feet wide, and other widths in proportion; but if the Road is not to be very much frequented less may serve.

It is absolutely necessary to get as good gravel as possible,

possible, and as little mixt with earth as can be procured; when there is too much earth in it, the best way is to screen it, or else the first rain will produce a large quantity of dirt and mud, particularly if the earth mixed with the gravel is of a fat greasy nature. For this reason, the best gravel should diligently be searched for. Signs of it are sometimes seen on the surface of the land, but when this is not the case it must be dug for on the hills in dry parched spots, and where springs of water issue from the ground.

Gravel is not every where to be met with, particularly in the mountainous part of the country, where they are obliged to use rock stones instead of it, but they are not so proper for the purpose. In some places they are under a necessity of breaking stones to pieces to serve instead of gravel; and in others they use a kind of hard binding sand, which makes very good Roads.

In towns and villages the inhabitants cannot do better than to pave their Streets, for the frequent gathering of the mud carries away all the gravel.

II. To carry Roads through marshy or boggy grounds, in order to prevent a great quantity of materials from being used, and this frequently repeated, a number of faggots should be made of green wood, as long as the width of the Road, and bound in different parts: these are to be laid side by side, and strongly bound together, and over them is to be put a good bed of straw, or coarse marsh hay, upon which the materials for the Road are to be laid, without being under any apprehension of the faggots rotting; because, being out of the reach of the air, and always wet, they are effectually preserved from any danger of the kind. When the ditches are made, the earth must not be thrown on the Road, but the faggots must be laid immediately

ly next to the upper turf or sward, or the Road will not be secure and solid.

When the turf or peat-earth consists of a number of roots which bind it together, large and deep ditches may be made, in order to procure a considerable quantity of this turf, which is to be laid on the faggots to raise the Road, and form it into a causeway, taking care to dispose the upper turf very regularly at the edges and on the top. When this last turf has again taken root, and the whole has acquired some degree of consistence, it is to be loaded with stones and gravel, without being under any apprehension of these materials sinking and being lost; the roots will keep them up, and the lower part of the causeway being much drier than at first it was, will prevent the impulsion of the waggon wheels from having any immediate effect on the soft part, the weight being divided on too large a basis to produce any bad consequences.

It may be necessary, however, to observe, that it is only in bogs this method is to be practised. When there is only a wet and clayey bottom, all that is to be done is to make good ditches to carry off the water, and sometimes to raise the soil a little; after which the Road is to be made in the same manner as on dry grounds: the few materials which will sink before it gets to a sound bottom, not being an object of sufficient importance to occasion our taking the precautions recommended in boggy grounds.

III. In ascents and descents care must be taken to ease them as much as possible. Such as are not long, may be remedied by taking a great deal of earth from the top, and filling up with it the bottom, this, by lengthening the slope, will of course make it easier; but when we find ascents or descents which are too long or too steep, and which cannot be avoided by passing on one side, we must endeavour to make the Road compass it as it were, for
there

there is no other way of easing the slope but by lengthening it; and if this cannot be done, the Road and the upper ditch, (for there must be none below) should be well paved, and there should be here and there open drains to give a passage to the water out of the ditch, that it may not damage the Road.

When the side of a hill is to be passed, after having traced and marked the middle of the Road, a wall of strong work is to be built at the distance of half the width of the Road below this middle mark, and is to be raised as high as the middle. The space below is then to be filled with the earth or stone that is taken from the upper half, a reasonable slope being left on the top. That the ditch may not be speedily filled, there should be several cross gutters to carry off the water; but great care must be taken in the choice of the stones of which they are made, and that they be fixed deep in the ground, and well supported by others, lest they should be displaced and occasion the carriages to jolt too much.

When a Road is to be made on a solid rock, whether on a mountain or in a plain, it is not enough to blow up the rock and level the way, as this would last but a very little while, but the rock should be covered with large stones to the thickness of two feet, then smaller, and over all, the smallest stone rubbish, which together will form a solid mass, not to be put out of order by the jolts of waggon wheels.

If there is a necessity of making short turnings or elbows, the Road in such places should be at least twice as broad as in the other parts, that the thiller horse may not have the whole load to draw whilst the others are turning; and such place should also be made as level as possible.

Roads on mountains being very subject to be filled with heaps of snow, some large piles should be driven at proper distances on each side of the Road, in order to distinguish it.

IV. When

IV. When a Road runs along the bank of a river subject to overflow, or runs through a bottom sometimes filled with water, a causeway should be raised at least two feet above the highest rise of the water, supported by strong walls; but if it does not require to be much raised, a long sloping bank well turfed may do.

If the Road is near a torrent that is apt to change its bed, and threatens to damage or destroy the works, instead of defending the Road at a great expence by large banks, it is much better to apply the remedy where the torrent has broke from its channel, and there make a strong wall or bank to oblige it to resume its ancient course; this is by much the best, as well as the least expensive and dangerous way.

V. There are, on the borders of lakes, Roads which, when these lakes are filled with water and agitated by the wind, are in danger of being destroyed by the fury of the waves. If, in order to remedy this, it should be judged proper to make wharfs of hewn stone, it is absolutely necessary that the mason's work should be raised on a strong frame of timber, so that the whole may form one entire mass capable of resisting the waves. This frame work should always be under water, even when it is at the lowest; and it will be proper to defend the works by a few rows of small piles interwoven with the branches of willows or oziers, that the waves may not in their reflux carry away with them the soil or gravel on which the frame work rests: but as the lakes sometimes rise about five feet in the spring, on the melting of the snow, the wharfs should be made at least eight feet high, that they may not be overtopped by the water; by which it is evident, that this method is very expensive, and not be practised to any considerable extent.

Instead of this method, large oak piles may be driven

driven down, so as to form a dyke; these may be kept in their places by oak traverse pieces, the ends of which may rest on piles shorter and more advanced than the first: behind these piles the work of making the road may be begun, by laying down large stones, which will not pass through the intervals of the piles. When the work is raised about as high as the cross pieces, laid half as high as the Road, some pieces of oak, twelve feet long or more, are to be got, the largest ends of which are to rest on the middle of each cross piece, lapping enough over it to steady it by means of a deep notch, or a pin driven into a large hole: the rest is to go into the Road, and is to have at the other end a traverse, or cross piece, at least eight feet long, which is to be fixed down by common piles; after this the Road is to be compleated. In this manner the great piles will be kept steady by the traverses or cross pieces, and these last, by the pieces or arms which enter into the substance of the Road, the weight of which keeps all in due order.

If there happens to be such a bottom as makes it improper to drive piles, a border of as large stones as can be procured must do, but they must be laid deep, and lengthways towards the Road. Behind these some smaller may be put to form the Road, but they must be regularly disposed that they may serve as a foundation to the upper border; on the first bed may be put a second, till it is raised to a convenient height, observing to allow a proper slope.

In places where the lake is not very deep near the banks, and where large stones are at hand, it would be of great service to raise some large heaps at a proper distance from the shore, so that they are some feet above the water, driving round them some large oak piles.

These great heaps receiving the impulse of the waves, which would break on them, would doubtless

less at first be put out of order; but when their bottom was extended, and they were loaded with more stones, the vacancies of which would be filled by gravel, they would form a mass capable of resisting the waves, the impetuosity of which is mostly derived from a successive motion, without obstacle, and which would therefore of course loose a great part of their power before they reached the bank. By making these heaps or moles at first about 200 paces one from the other, it is not to be doubted but they would have so good an effect, that others would afterwards be made between them: besides, it is to be presumed that the waves would cast behind the moles heaps of gravel, which would give them a still greater consistence.

On shores where there is a great deal of gravel, dams may be made to run out into the lake, leaning towards the wind, which generally blows in that place; the angles they form with the shore will, by the violent agitation of the water, be filled with a large heap of gravel, which may be taken away and used wherever there is occasion for it, as another heap will soon gather.

These dams, if large stones are at hand, may be made entirely of stone-work like the above mentioned moles, beginning near the shore: If this is not the case, to save expence, frames may be made with large pieces of timber, these may be laid one on the other to the number of three or four, if there should be occasion, after which the empty space in the middle may be filled with whatever materials are at hand, and the whole will form a mass capable of resisting the waves.

VI. In all the preceding parts of this Essay, only great Roads have been the subject; and to say something of the cross Roads which come into them, it would be useful if, in every hundred, commissioners were appointed, sensible intelligent men, to see where they

they would be of most use, and to draw up a plan of the manner in which they should be made; regard being had to the nature and extent of the Roads, the ability of the inhabitants, the distance from which the materials are to be fetched, and to there not being any occasion for making them as solid and regular as the great Roads: when this was done, orders might in consequence be issued to the hundreds, with instructions to mend their Roads.

Before I conclude this first part it may be necessary to observe, That when rocks or large stones are to be blown up with gunpowder, it is best to use borers about six feet long. Their weight will soon give them entrance, and they only wear at the end that bores, which is from time to time to be new laid with well tempered steel; one man will manage them without using a hammer: on the contrary, with a common borer, two men strike whilst a third directs it, and the instrument is soon rendered unfit for use. The rock must be bored dry, and it is better to use some of the fragments of the rock, well driven in, to fill up the hole after the powder is put in, than a plug of wood, leaving a small place to set fire to it.

If long stones are to be blown up, they are to be bored lengthways, and the powder will have a greater effect. Experience also teaches us, that if they are bored into the part which touches the ground, it will be of advantage; therefore, when it can be done, they should be turned over, or thrown into a hole dug on one side of them.

Whenever the workmen meet with rocks that are split and shivered, so that the powder will not have any effect on them, large iron crows are used, with sledge hammers, wedges and pick-axes.

It is of great use to see what part of the work can be done by undertakers, such as digging the ditches, carrying the earth, turving, &c. it being often advantageous to make such contracts; but then great

care must be taken in making the bargain, that the surveyor is not imposed on.

SECOND PART.

Of keeping the Roads in repair.

Besides the good regulations which already subsist in the several districts, with respect to keeping the Roads in repair, it will be proper to have an intelligent overseer who shall be sworn to do his duty, and is capable of making himself respected. To him should the care of a certain quarter be committed, with express orders to visit the Road every two months, noting down all the defects he may meet with, such as sinkings in the Road, deep ruts, breaches in the ditches, drains damaged, pavements out of repair, ditches filled up, or any nuisances whatever in the Road, of which he is to make his report to the justices of the peace, who will in consequence issue out an order to the respective parishes to set about what repairs may be immediately necessary, under the penalty of a certain fine in case of neglect: if the work is not then done, before the next visitation, the fine should be levied and the order renewed, with an injunction, that if it is not done before the next visitation, the justices will order the work to be done at the expence of the parish so neglecting.

The other less pressing repairs, such as scouring the ditches, or laying on fresh gravel wherever it is wanting, may be postponed to some leisure season of the year, at which time such parishes as have not gravel near at hand, will do well to get together some large heaps, ready to use as occasion may require.

Waggons or carts with broad fellies to the wheels do least damage to the Roads. Heavy loads should
not

not be permitted with narrow wheels, as they hurt the Roads greatly, particularly in coming down hill, when they are obliged to chain a wheel; this wheel should be supported by a piece of wood fastened to it, which, by its greater breadth, would occasion less damage.

The Road should not be littered, nor the ditches filled up with the stones picked up off the arable lands, nor with wood, faggots or dung.

The hedges should be regularly cut, to give air to the Roads, and prevent the snow from gathering.

In every village there should be a particular overseer, who should frequently visit the Roads, cause the ruts to be filled up, and the most necessary repairs to be done. There are some very good laws on these heads which should be enforced.

Without prescribing the felines of the wheels to be made as wide as they are in England, namely nine inches, it would yet be proper to have them wider than are commonly made, and that the heads of the nails that fasten the tires should be let into the iron; by this means deep ruts would in a great measure be avoided.

It is not by any means proper to suffer trees to be planted on the banks of a Road; if the owner of the lands adjoining to the Road chuses to plant trees, let them at least be four yards from the edge of the Road; and if rows are to be planted, let the trees, according to their kinds, be at the distance of thirty feet one from the other, or more.

Remarks on the Utility of Public Roads.

Though I intended at first to have treated only of the Construction of great Roads, yet I imagine a few remarks on their utility may not be displeasing.

The good of individuals is so intimately connected

with the prosperity of the state, that it is now become an axiom in politicks; I shall therefore confine myself to setting forth only a part of the advantages derived to Society in general from the establishment of public Roads.

They save a great deal of labour, promote population and industry, and give new life to Agriculture. The great benefit resulting from them will soon repay the expence of their construction.

Agriculture, which on all accounts ought to be encouraged, derives many advantages from them. The farmer, who sometimes carries goods for hire, can go his journies in good Roads with fewer cattle, less labour, and in a shorter time. As to his particular self, he also receives benefit from them, being less exposed to the disorders arising from his heating his blood, and from his labour in getting his carriage out of a deep rut, when it may chance to set, without mentioning the continual danger he is in of losing his life, or of being maimed by the ice in the Roads, or his carriage overturning.

His draught cattle are exposed to the same dangers, run the same risks, and last but a little while in bad Roads, so that there are always losses to supply: on the contrary, in good Roads all this is avoided. His harness and traces also last a much shorter time, by the frequent and violent straining there is in bad Roads.

Where the Roads are good, a farmer will have occasion for fewer draught horses, and if it is more convenient he may keep oxen, which may always be sold to advantage.

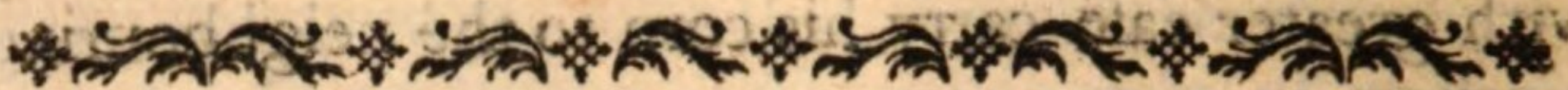
In certain seasons he will also find it of singular advantage to be able to bring home in a shorter time such part of his crops as may happen to lay at some distance from his house; and it must surely be esteemed a very particular advantage when a farmer

farmer has good Roads round him, so that he may with greater ease carry his corn to the neighbouring markets.

Inland trade is often hurt by the delays which bad Roads frequently occasion, but good Roads give a briskness to trade, and cause a great saving in the article of carriage; and there will still be a more considerable saving in this last article, if it can be contrived that the goods may go part of the way by water carriage, which is by far cheaper than land carriage.

I shall not enlarge on the innumerable advantages which the towns and counties, the sea-ports, travellers, and in fact every individual of the state, may receive from good Roads. The easiness of carriage, the quickness, safety, and savings resulting from good Roads, are objects in which every one has concern.

I shall conclude this Essay by observing, that if we consider the many advantages of all kinds resulting from good public Roads, to every member of Society, and set them against the expences of making such Roads, we shall soon be well convinced that the government could not do a better thing than to enforce the making them in all parts, as their utility would be immediately apparent, the expences soon returned, and the consequences highly advantageous.



ARTICLE XXVII.

A Letter to the AUTHORS, relative to the Lentils of Canada.

Gentlemen,

I SEE by Article the Second of your Foreign Essays, of which I am a purchaser, that one M. Dumefnil Costé has introduced the Culture of what he calls the Lentil of Canada, in Normandy, and that by several experiments, which have been made, it succeeds very well there.

I find also by the Essay above referred to, that this plant yields plenty of excellent fodder for horses and black cattle; therefore, being a great lover of husbandry, and fond of making improvements in it, I am of opinion, that it would be highly advantageous to introduce the culture of the above Lentil in England, as we cannot have too great a variety of artificial pastures; the more we have, the better shall we be able to adapt some of them to every soil, situation, and exposure.

I think there cannot be the least doubt of this plants succeeding well in our Island, the climate of which does not essentially differ from that of Normandy, especially in the southern and western parts; and it must be acknowledged, that it is more favourable than the climate of Canada, where this Lentil seems to be a native.

I should myself be glad of an opportunity of trying how far we might depend on success in its culture, but that I have no opportunity of procuring any of the seed. Let me therefore request, that if any of your readers should chance to know any person in England of whom I could procure it, they will

will be kind enough to inform me, through the channel of this work, and I shall not fail acknowledging the obligation.

My reason for making this request is, because I think it not unlikely that some of this Lentil seed may have been brought over in the ships which have arrived from Canada since it has been in our possession; and I had much rather have it genuine from thence, than give myself the trouble of procuring it from Normandy, where probably it is not much improved by culture.

I am, Gentlemen,

Wells, Somerset-
shire, Feb. 28,
1765.

Your humble Servant,
and Well-wisher,

RURICOLA.



ARTICLE XXVIII.

*Some Remarks on the foreign method of mowing Wheat,
in a Letter to the AUTHORS.*

GENTLEMEN,

ONE of the present favorite topics, in conversation amongst the more intelligent Farmers, is the mowing of Wheat, which has of late found many advocates; on the other hand, numbers think it cannot, to any advantage, be introduced.

A very worthy Gentleman, in Northamptonshire, made the year before last some experiments in this matter with three different sorts of scythes, an account of which was sent up to the Secretary of the Society for the Encouragement of Arts, Manufactures, and Commerce, and afterwards published in
the

the Museum Rusticum, &c. a well known periodical work on Husbandry.

This occasioned many arguments for and against the practice, and amongst others I saw, in the above work, some very sensible letters on the subject from the Rev. Mr. Comber, of East Newton, in Yorkshire. This Gentleman, with great propriety, recommends, that some men from the Wolds in Yorkshire, where they mow all their Wheat, should be sent into the South, to convince their countrymen of the many advantages resulting from this practice.

The arguments on this head produced several calculations to ascertain how much would be saved in point of labour by mowing Wheat. These calculations of course differed; but I do not remember, that any of the savings amounted to so much as what I see mentioned in page 21, of your work, where the Marquis de Costa says, that he saves half the expence of labour, and that there are many other benefits attending this practice.

Now if this is the case, Gentlemen, surely we English Farmers must be madmen not to adopt a method which would be productive of so great a saving to us, and which would besides enable us to house our corn much sooner than we now can do.

I generally grow every year about one hundred acres of Wheat, which cost me, say, five shillings an acre reaping, making twenty-five pounds in the whole; now to save the half would be twelve pounds ten shillings, and surely this sum is worth attending to, especially at a time when money with farmers is very scarce.

For my part I am well nigh convinced, by what I have read on the subject, and am almost determined to mow all my Wheat next harvest, having but one single objection to make to it, which I should

should be glad if Mr. Comber, or any other public spirited Gentleman, would answer.

My farm consists of what is called good Wheat land, rather strong than otherwise, and is situated in the eastern part of the county of Essex. Being also near a considerable market town, I have it in my power to buy plenty of manure, which I never fail doing. The consequence is, that my crops are for the most part large and heavy, from four to five quarters on an acre; now I am rather suspicious, that in such heavy crops a mower would find it very difficult to carry over the swarth without scattering, and on this would greatly depend the neatness of the work.

I wish I could know whether the crops of Wheat in the Wolds of Yorkshire are strong and heavy, or light and thin; if the latter, it would be some discouragement to me, because, though I am fully satisfied, in my own mind, that a thin crop of Wheat may be mown to advantage, yet I cannot so readily assent, till I know somebody has seen it done, that a heavy, thick, stout crop can be at all mown.

I hope, Gentlemen, you will pardon this trouble; my doubts, in some measure, arose from reading the Marquis de Costa's assertion, and it was natural I should declare them to you, in whose work his Essay made its first appearance in English.

Mr. Comber is, as I am informed by a person well acquainted with him at college, a Gentleman who is very fond of improvements in agriculture, and reads almost all the books published on that subject; I have, therefore, not the least doubt but he is a reader of your Foreign Essays, which I much approve of, and hope he will give me some satisfaction, by easing my mind of the abovementioned doubts; and particularly, that he will inform me, and the public, whether there are any strong highly

manured lands in the Wolds whereon the Wheat is mown.

I am, Gentlemen,
March 1, your Reader, and obedient Servant,
 1765. J. W.



A R T I C L E. XXIX.

An Essay on the Culture of Coleseed, as practised by the Flemish Farmers, written by the Marquis DE TURBILLI.

COLESEED, as is evident from the etymology of the name, if we derive it from the Latin *Caulis*, is a kind of cabbage, but it grows loose, not close and cabbaged as the last mentioned plant; it has, however, the same taste, and resembles it so much, that it might easily be mistaken for it.

It is cultivated in very large quantities, and with great success in the Low-Countries, particularly in the neighbourhood of Lisle, where a considerable traffic in it is carried on.

There are three sorts of Coleseed, the white, the warm, and the cold.

The white is so called on account of its having a white flower; it is not above three or four years ago that it was introduced into Flanders from Holland. They say it resists the frost better, yields somewhat more seed, and is ripe about ten or fifteen days later than the next sort.

The warm Coleseed is most common in Flanders, and is esteemed the best, because it thrives in every soil, and requires less manure.

The cold Coleseed seems to have been brought from Holland as well as the white, it is without doubt

doubt the hardiest, resisting the frost best, and grows to a greater height and size; it sometimes attains the height of nine or ten feet, its seed is also larger, but this difference is scarcely perceivable; it is more subject to be damaged by insects than the others, and does not like them send forth branches from the bottom of the stalk; it also requires a greater plenty of manure.

The two last mentioned sorts of Coleseed have a yellow flower.

All sorts of Coleseed are cultivated in the same manner; all grow more or less towards their natural perfection, yield more or less seed; and this seed is of a better or worse quality, according to the nature of the soil on which the Coleseed was sown, the good or bad husbandry that was bestowed on it, the favourableness of the season, and the manner in which it escaped other accidents to which it is subject.

Every part of Coleseed is of use; the seed from which the chief profit arises, yields an oil, fit for burning, for making black soap, for dressing of leather, and the fullers use it on their woollen stuffs.

All the seeds of the several kinds of Coleseed are of the same form; they are small, round, and of a blackish colour; they all of them yield nearly an equal quantity of oil, when they are equally dry and weighty. By bruising some seeds on a table we may discover in what degree they are oily, and it is after making this slight trial that the merchants fix a price on it. There are above an hundred oil mills at work in the neighbourhood of Lisle in bruising this seed; they call them Tordaires. Part of the oil that is made in them is consumed in the country, and the remainder is exported into Picardy, Champagne, and several other provinces of France.

The duty the farmers-general receive from the rape oil, made in the district of Lisle only, which

is only nine leagues long, and as much broad, amounts to more than 300,000 livres, after deducting the expences of collecting it. This duty is only three livres a barrel, containing about 240 pounds of oil, according to the Marc weight about eight ounces.

We may hence not only judge what prodigious quantities of Coleseed are raised in the whole extent of Flanders, but also of what infinite use this plant must be, when the farmers of these provinces are so fond of cultivating it, though their lands are capable of yielding any other kind of crop in abundance.

The cakes, from which the oil has been extracted, serve to bring up, feed and fatten cattle of all kinds, oxen, cows, and sheep. They are given to them crumbled and mixed with bran; the cows that feed on them give plenty of milk.

These oil-cakes have also a property which is not of less value; they are an excellent manure for land on which Coleseed is intended either to be sown or planted, and even benefit the crop which succeeds the Coleseed. They use them often in this way in the neighbourhood of Lisle. About 300 of them being reduced to powder will manure an acre.

Every kind of cattle will also eat the cavings of the seed and the little tufts of leaves on the plants. When this fodder is to be kept for the winter consumption, it must be carefully preserved, or it will rot.

These cavings are also used for making drenches for cows, and the stalks of the large Coleseed serve to heat the oven, to bed the barns, and even to make manure; but this last requires time, because it does not easily rot.

Coleseed thrives best in deep kindly soils, but with plenty of manure and deep plowing it will grow any where. I have seen it yield good crops on

on dry chalky soils, on which street dirt had been laid.

As Flanders is past all doubt the country where Coleseed is most usefully cultivated ; I shall, with as much exactness as I can, describe the methods they practise there, and shall only mention those of Picardy and the Soissonnois, where this culture is less extensive, in order to point out their defects.

Coleseed is sown and transplanted like cabbages : they give two plowings to the land before winter, and it is not of much consequence what crop it was last under.

In the month of May a deep plowing is given to the land ; it is harrowed two or three times, and then rolled, in order to make it fine.

Towards the 18th or 24th of July, it is again plowed, and is also harrowed and rolled, till it is reduced, as it were, as fine as ashes ; the seed which should not be heated, is then sown on it, being scattered by the three fingers ; it is to be lightly covered with the harrow, and afterwards rolled.

Twenty-four pounds of seed will sow three acres, and the plants on these three acres will fill twelve others. Coleseed is transplanted after any crop whatever,

The land intended to receive the Coleseed plants, should be twice plowed, as soon as the crop is carried off. About ten or fifteen days afterwards it is to be once or twice harrowed, and towards the end of September it is to have a very deep plowing. In this last plowing there should be an open furrow or trench every five bouts. If the field does not lay level, it is to be plowed obliquely, so that there may be an easy fall for the water.

The best and most promising plants are gathered, and being tied in bunches, are carried to the field where they are to be transplanted, by the time the
last

last plowing is compleated, and the workmen are ready for them.

There will always remain a number of plants in the land where they were sown; these are generally fed off with cattle, and they never let them stand to ripen, except when they manure the land for another crop.

The season for transplanting Coleseed is the beginning of October. The plants are placed in rows a-cross the furrows. The rows are one foot asunder, and the plants in the rows about six inches distance one from the other. The manner in which this work is done, is as follows. A certain number of men advance in a parallel line, each having a dibble or spade handle, with two large iron points to it, six inches asunder; they drive this instrument into the ground; the women and children follow, who put a plant into every hole, and fettle it with their heel, in this manner working with feet and hands at the same time, which it is easy enough to do, and it saves some expence.

When all the Coleseed is transplanted, if the land to which it was removed was not dunged before it was plowed, it must be sown with pidgeons dung reduced to powder; this of all other manures whatever has the most immediate and proper effect on the vegetation of this plant; sixty bushels will be enough for two acres.

When this is done the loose earth in the trenches or open furrows, is to be thrown with a shovel amongst the plants in the rows.

Early in the spring, a spit of earth out of the trenches is in like manner to be cast amongst the plants of Coleseed in the rows. This slight tillage gives vigour to the crop, choaks the weeds, and keeps the soil loose.

The rows of Coleseed form so many beds, and
when

when it thrives well the trenches are entirely covered, and the whole resembles a thick copse.

It may not be amiss to mention in this place, that Coleseed thrives perfectly well in new enclosed lands.

The seed is fit to gather about the beginning of July. When it turns yellow, it is reaped like corn, and is laid in pretty large gavels on the beds, where it remains three or four days; it is then carried in cloths, in order to prevent any of the seed from being lost, for it is very ready to drop.

In one or several parts of the field, in proportion to its extent, and to the quantity of Coleseed there is, the crop is formed into several stacks.

The Flemish farmers never thatch these stacks; they know so well how to make them, that the rain never does them any damage.

The Coleseed heats in the mow, by that means yielding more oil than it would, if it had not been stacked.

In the month of September they make a kind of floor in the field, whereon they thresh and dress their Coleseed.

If a farmer should incline to thresh his Coleseed without stacking, it will be necessary for him to leave the gavels longer exposed to the air on the beds.

Coleseed may be cut at any time of the day, provided it does not shed; if it does, it should only be cut morning and evening.

As a whole field does not all ripen at the same time, it should be cut in different portions, being laid in gavels or reaps, the changes of weather will not effect it.

It may be safely stacked three or four hours after rain, provided it had previously been sometime in gavels, and was judged sufficiently dry.

In order to clean the seed, parchment sieves are used,

used, if there is any wind stirring; but if it is calm, wind-fans are substituted in their stead.

The seed is put into a granary, and being frequently stirred, is preserved till it is sent to the mill to be pressed for oil. That which is driest is best, and of the dry seed the heaviest yields most oil, and should be preferred for sowing.

The crop of an acre of Coleseed may one year with another be worth in Flanders betwixt eight and nine pound sterling (180 livres), from which we must deduct ten or twelve shillings an acre for the expences of transplanting and digging the trenches; but then, if the culture of Coleseed requires these expences, it requires very little seed, and the crop is threshed at a small expence.

As soon as the Coleseed is stacked or off the land, the grass which is found in great plenty is fed down by sheep, and the land is then well plowed in order to its being sown with corn.

The open furrows or trenches are filled by one bout of the plow, throwing over a furrow on each side of them. It is to be remarked that Coleseed should not be sown in the same land above once in five or six years.

Though they raise in Flanders a prodigious quantity of Coleseed, yet they have not less wheat nor fewer oats than in the Soissonnois, where they sow nothing else. It is true, that there is a more considerable trade in corn carried on there than in Flanders; but then the home consumption is ten times as large in that country, which is infinitely more populous, full of troops, and where very little land is seen to lay fallow. That into which the Coleseed is transplanted is esteemed such, on account of the tillage and manure it requires.

We must not attribute this fertility solely to the richness of the soil of that country; industry, a number of inhabitants, and the numbers of cattle
and

and quantities of manure they have, greatly contribute to it. It has like all other countries lands of an inferior quality, and of various kinds; and if the number of people, the cattle, and the manure, were reduced to the same state as in the Soissonnois, the agriculture of Flanders would not long be superior to that of the last mentioned province.

The Flemish farmers maintain great numbers of cattle, on account of the ease with which they can keep them; besides the herbage, which they have only in common with other provinces, though in greater plenty, the cakes of the Coleseed after the oil is pressed out, which remain to the farmer, are an excellent and very considerable resource. To these we may add malt, flax-seed, madder-leaves, salt at a low price, &c.

This great number of cattle occasions them to have plenty of dung. Besides common yard dung, their wood-ashes, Coal-ashes, Dutch and Flanders turf, furnish the Flemish farmers with the means of improving their lands.

They also know the advantages resulting from another kind of manure, which it may be deemed indelicate to mention; it is become an article of commerce, the king receives a duty from it, and it cannot be carried to any distance without a permit, whilst in other places it is scarcely ever applied to any use.

It is then owing to constant attention and expence, and to a perfect knowledge and application of every kind of manure, that in Flanders the land owners receive large rents from their estates, and the farmers, who pay heavier taxes than in France, tho' levied in a different manner, have such large profits, that they make fortunes.

From these observations we may conclude, that it would be dangerous for farmers in districts where manures are not in great plenty, to attach them-

selves at once to the culture of Coleseed, because that plant requires so much manure, that there would not be enough left for their corn, which the farmers might be apt to neglect, on account of the larger profit arising from Coleseed; but it would be highly useful to introduce it by degrees into the best lands, and afterwards extend its culture in the same proportion, that the quantities of manure may encrease. This would occasion a brisker circulation of money, and the farmer would have a new resource for maintaining his cattle, and improving his land.

He would in France have a great advantage over the Flemish farmer, as he would sell his seed in proportion to the price of oil, which cannot but be encreased by the carriage and the waste in transporting it from place to place. Mills used to press any other seed would do for Coleseed, and indeed it would soon be worth while to erect mills on purpose, if the culture of this plant was extended to any considerable degree in France.

In some years corn bearing a very low price, it is the interest of farmers to lay it by. The culture of Coleseed soon pays itself, the seed selling immediately for a good price, this would enable them to pay their rents without breaking in upon their stocks of corn.

Transplanted Coleseed is liable to be many ways injured; scarcely has it taken root but the rabbits and hares will eat it down close to the stalk, so that it is in vain to think of cultivating this plant where there is great plenty of game.

In some years the fly destroys the blossoms of the Coleseed plants, if the field happens to be near a wood, as soon as they are opened; but if a lucky rain falls it kills them: the latter blossoms knit, and there will still be a good crop. If no rain falls on this occasion, the plants must be given to the cattle,

tle, and the field be plowed up. This accident very seldom happens, if the Coleseed is not sown near a wood.

As Coleseed ripens it should be guarded by boys, or the pigeons, which are very fond of it, will destroy the greatest part.

Such sorts of game as feed on Coleseed acquire the taste of it; this is the reason that the game about Lisle is not much esteemed. This food is still worse for pigeons, it gives their young ones a kind of scab, so that in Flanders they are not eaten in the Coleseed season.

Coleseed is sometimes attacked by the smut, particularly if it is transplanted on low grounds too much dunged, and subject to fogs. It is not known to be subject to any other disease.

In the neighbourhood of Clermont in Beauvoisis, they let the Coleseed ripen in the field where it was first sown; but if they considered, that Coleseed is not fond of moisture, that it shoots forth large roots into the earth, and grows to a great height with numerous wide extended branches, they would be sensible that the land being covered with too many plants must be impoverished, and that plants, which stand so close together, cannot grow to their full size; thus, in this way, the land is impoverished, the weeds are left to perfect and shed their seeds in it, and not only the crop of Coleseed is very indifferent, but also the crops which succeed it.

In order to restore this land to a good condition, it must be well manured and fallowed.

Coleseed extracts such a quantity of salts from the earth, that the Flemish farmers transplant it, as well to divide betwixt two pieces of land the losses in point of quality it occasions to the soil, as to procure better crops. For both these reasons they also sometimes transplant their Coleseed on land newly broke up. In the country of Amiens they trans-
plant

plant their Coleseed after the plough in close furrows; this method is better than that last mentioned, but it is greatly inferior to the Flemish method, for the rows are disordered, and the plants crushed by the horses feet, and, having besides no fresh earth laid on them, they cannot grow to be such fine plants: and, on the other hand, the earth, which is not kept stirring, cannot receive any considerable benefit from the influences of the air.

There is however a case in which this method must be resorted to, which is, when the plants are grown so tall and have such long roots, that proper holes cannot well be made for them with a dibble, they should be laid in the furrows after a plough, and open furrows or trenches should be left at the distances I have already laid down; but the earth from these trenches is with greater difficulty thrown on the beds, because the Coleseed in this method is planted lengthways, whereas, in the other method of transplanting, the plants cross the beds.

I must say a few words more on the subject of these open trenches, and the casting of the earth from them on to the beds; which is, that they supply the soil with an additional quantity of salts, sweeten it, increase the depth of the upper bed, kill the couch grass, and other weeds. The farmers in the neighbourhood of Lisle are so well persuaded of the advantages resulting from them, that after the Coleseed is off the land, they form more trenches along the middle of the beds, that they may have finer crops of corn.

In the year 1755 I saw in the neighbourhood of Guise some Coleseed transplanted into a field, containing about 18 acres, which had always borne fine corn, but had no great depth of soil.

At the depth of seven or eight inches lay a bed of red clay, which the farmers are so much afraid of mixing with their good earth. This land was first
well

well dunged, and when the Coleseed was transplanted, the red earth which came out of the trenches was thrown on the beds.

All the inhabitants of the country flocked to see this work executed, which was under the direction of a Flemish Farmer. They pretended that he spoiled the land, and that no corn would grow on it afterwards.

However, during the course of the winter, the red clay became mellowed, the rains, which washed the dung, ran into the trenches, carrying with it a sediment and a portion of salts, improving the earth that was in the ensuing spring to be thrown on the beds amongst the rows of the Coleseed, which came on amazingly.

At the harvesting of the next crop, the inhabitants did not fail coming to see what sort of corn succeeded the Coleseed; and being perfectly well convinced, that it was much finer than the land was accustomed to bear, they laid aside their prejudices, and adopted the planting of Coleseed.

In the year 1761 there was in that single quarter above 100 acres of transplanted Coleseed.

I imagine it will be quite unnecessary to use any farther argument, to make it evident, that the Flemish method is by much the best, not only as far as it regards the Coleseed, but also with respect to succeeding crops.

It is uniformly practised in this country, where they have been attached to it time out of mind; whereas in other places, where this culture is as it were but lately introduced, every farmer has a method peculiar to himself, whence we may conclude, that the method which should be universally practised is not yet sufficiently known.



ARTICLE XXX.

Some Queries respecting the Silesia Wheat, to which is added, a Comparison of the Expences of its Culture and Produce with the English Wheat, contained in a Letter to the AUTHORS.

GENTLEMEN,

I HAVE read in the first part of your work, p. 80, an account of a sort of Wheat which is there said to grow in Silesia; now if this account is true, which I have no reason to doubt, our good ally, the King of Prussia, would do us an essential service if he would send us over a parcel of this corn to England, that we might try what success we should have in its culture.

Silesia, as I am informed, for I was never there, is a fine corn country, and they say the farmers are intelligent, industrious, and of course warm.

I am very sorry Mr. Dumesnil Costé did not give a more full description of this Wheat, with which he seems to be well acquainted. He does not tell us whether it has awns, or is without beards, like the common Wheat.

Perhaps some of your readers or correspondents may be able to supply his deficiencies, and to inform us farmers, who have never travelled ten miles beyond the limits of the county we live in, whether we have not in some part of England, Ireland, or Scotland, a sort of Wheat of the same nature as that so much recommended by the above French Gentleman.

I find the best quality of this Wheat is its not being subject to the smut, which is indeed a fatal disorder;

order; and I own this is a great advantage, and a powerful motive, to induce us to make a trial of it at least.

The French Gentleman adds, that this Wheat is less apt to lodge, having a pith in the straw, which makes it stronger.

This is also another advantage, because the best crops are most subject to lodge.

As to what the Gentleman says about giving the straw to cattle in the winter, as is the custom of the Germans, it is but little worth our notice, for our cattle have generally better fodder in winter than chopped straw; and, if I remember right, the public papers informed us, that last war very many of our English horses were starved to death by being fed with this German chopped straw: but different countries have, they say, their different customs.

M. Dumesnil Costé says it yields larger returns than common Wheat; I wish he had mentioned the proportions of the several crops, we could then have judged for ourselves; for if the crop of Silesia Wheat should only be a little larger, the badness of the quality of the bread made of it, will throw the ballance on the other side the question.

We farmers have still another reason to lament, that this Gentleman has not given an account how many more bushels this Wheat will yield from an acre than the common Wheat. It requires, I find, a rich soil well prepared; it is not said whether the soil should be light or strong; now a rich well prepared soil, of a good substance, is what we always prefer for our best Wheats; and according to all appearance it will not be worth while to sow on such land the Silesia Wheat, especially as more seed must be used than when common Wheat is sown.

I shall now endeavour to form some comparison betwixt these two sorts of Wheat.

I will

I will in the first place suppose the cost of preparing the land for sowing to be the same, so that I shall at this period begin my account.

I generally sow on my good land (say) three bushels of Wheat per acre; and let us allow half a bushel more for Silesia Wheat, each at six shillings the bushel.

At harvest my Wheat costs me five shillings per acre reaping; for the Silesia Wheat as being a thicker crop and more apt to shed, so that more care must be taken, we must allow six shillings per acre.

We will call the crop of an acre of common Wheat on good land thirty-two bushels; and we will admit, that on the same land the Silesia Wheat would yield thirty-six bushels per acre, which is allowing a great deal.

I pay two shillings per quarter for threshing, &c. my common Wheat; now for the Silesia Wheat we cannot allow less than three shillings; the manner of separating it from the straw being so very peculiar, that I dare venture to say, the man who threshes common Wheat for two shillings will earn a great deal more in a day, than if he undertook at three shillings to separate the Silesia Wheat in the manner above referred to.

I will next suppose, that my English Wheat sells for four shillings and six-pence a bushel; and as the Silesia Wheat is confessedly of an inferior quality, making worse bread, I shall allow that at four shillings the bushel.

I omit to mention, that as the Silesia Wheat is a larger bulk, it will in proportion cost more carrying to market; because, I will candidly suppose, that the increased quantity of straw, chaff, and under corn will make nearly, if not totally amends for this difference.

I also admit any difference there may be in the expence of loading it and carting it home to the barn
in

in harvest, as this will not amount to any very considerable matter.

I shall proceed to make a comparison betwixt the two accounts, that we may be able to judge on which side the ballance will be.

Expences of Common Wheat.

Paid for three bushels of clean Wheat seed	£.	S.	D.
for sowing one acre of land, at 6 s. - -	0	18	0
For reaping, &c. one acre of Wheat - -	0	5	0
For threshing, &c. thirty-two bushels of			
Wheat, at 2 s. per quarter - - - - -	0	8	0
Total - -	1	11	0

Expences on Silesia Wheat.

Paid for fourteen pecks of Silesia Wheat, £.	S.	D.
at 6 s. per bushel - - - - -	1	1 0
For reaping one acre of the above Wheat,		
the crop being thick and apt to shed - -	0	6 0
Threshing, &c. thirty-six bushels of the		
same Wheat, at 3 s. per quarter - - -	0	13 6
Total of Silesia Wheat - -	£2	0 6
Of English Wheat - - - - -	1	11 0
Difference - - - - -	£0	9 6

Produce of Common Wheat.

Thirty-two bushels of Wheat, sold at 4 s. £.	S.	D.
and 6 d. per bushel - - - - -	7	4 0

Produce of Silesia Wheat.

Thirty-six bushels of Silesia Wheat, sold		
at 4 s. per bushel - - - - -	7	4 0
Difference - - -	£0	0 0

Thus we find then, that the difference in the expences amounts to nine shillings and six-pence; and that the difference in the sum returned by the sale is nothing, so that the farmer who should grow

one hundred acres of this Wheat in a year, instead of the common Wheat, would according to this account be near fifty pounds out of pocket.

I could have made a much wider difference, but I did not chuse to exaggerate matters; and, if I am in this account wrong, I should be glad if some of your readers or correspondents would set me right.

My only motive for this letter, is to gain what real knowledge I can respecting the Silesia Wheat; and I may add, that I shall ever be well pleased to guard my brother farmers against adopting too hastily the culture of other sorts of Wheat, than those which are already in every respect well known, which besides agree with our fickle climate.

If a farmer wishes to do service to his country by improving husbandry, let him, by all means, make small experiments at first; if these succeed, it will be some encouragement for him to proceed, and he will be sure not to hurt his circumstances.

It is now time for me to conclude, with wishing success to you, and all others, who endeavour to improve the state of our national husbandry.

I am, Gentlemen,

Your most obedient servant,

*North of London,
March 2, 1765.*

An Old FARMER.

ARTICLE



ARTICLE XXXI.

An Essay on the best Method of making Butter, on the Management of a Dairy, and salting Butter for keeping or exportation. Written by Mr. JORE, Secretary to the Society of Agriculture, established at Rouen in Normandy.

A CONSIDERABLE trade for Butter being carried on in France, not only for the supply of the great towns in the kingdom, but also for the use of the colonies, it is natural that we should contribute as much as possible to the perfection of this commodity; and this subject appeared to be of so much the more importance, as Normandy is capable of supplying a very considerable quantity of the best Butter, for it abounds with excellent pastures, which maintain a great number of milch cows.

All the inhabitants of Normandy know the defects of the Butter they make, but few of them are sensible that these defects are less to be attributed to the quality of their milk, than to the manner in which they manage their Dairies.

One single district is well skilled in this matter, and no other has benefitted by its example in the course of a great number of years.

By adopting the method practised in the country of Bray, which I am now about to describe, our Butter would be delicious and good at every season of the year, it would become a capital article of housewifry, as it would be proper for salting, and would keep for years together: by this means it might become an article of commerce, in preference to Butter made in a different manner, and save large

sums of money to the kingdom, which are now sent abroad to purchase this commodity, though of an inferior quality.

Observations made at Mervul, on the Manner of making Butter in the Country of Bray.

THE milk is set in cellars arched over with brickwork, deep and cool, somewhat resembling such vaults as are best adapted to keeping wine in proper order. The temperature of the air in them in winter as well as summer, is nearly from eight to ten degrees of M. Reaumur's Thermometer. They are paved with ordinary tiles, or simply with bricks laid flat.

When there is any reason to apprehend the heat penetrating into the cellars, the vent-holes are stopped with straw during the heat of the day.

In winter they take care that the cold should not get into this cellar, by stopping the vent-holes in like manner in frosty weather.

The door to these cellars, and the vent-holes should be either on the north or west side; the door is often within the dwelling-house, but always in a room where no fire is kept.

Neatness and cleanliness are so very essential in this cellar, that no wooden utensils, boards, &c. are suffered to be in it, because as these would soon rot in such a cool place; a disagreeable and musty smell would issue from them.

Not the least dirt is to be seen either on the roof, the edges of the air-holes, or on the floor; and in order to preserve this neatness, the pavement is frequently washed; and no-body comes in without putting on a pair of slippers, which stand ready at the door.

The persons who have the care of the Dairy put them on there, first pulling off their ordinary shoes;
the

the least smell, other than that of milk, which should be perceived in the Dairy, would be thought to injure the quality of the Butter, and would be attributed to the want of care in the maids.

Cleanliness is thought so extremely necessary towards the having good Butter, that in Saxony and Bavaria, they rub and wash the cows before they milk them, if they happen to have laid down in the cow-house.

The keelers in which the new milk is put, are earthen dishes scalded in hot water, in order to get off the stale milk that may be soaked into their substance. This stale milk is an invisible leaven, tho' well known, which sours the new milk. Constant experience has discovered this inconvenience. These dishes are fifteen inches wide at the top, six at the bottom, and six inches deep. These dimensions are from outside to outside; if they were deeper it would be hurtful, if they were wider it would be inconvenient.

The milk is brought from the pastures in the wooden pails or earthen pans, in which it was milked.

All copper vessels are esteemed dangerous to be used in a Dairy. The milk is suffered to remain quiet about an hour on the Dairy floor, till the froth is gone off, and the natural heat it had has quitted it. It is then poured into the dishes through a sieve, so that no cow hairs or dirt may remain in it.

The dishes are set on the floor of the Dairy, after it has been well cleaned; the coolness of the place communicates itself to the dishes, and prevents the milk from curdling; for every thing that is done in the Dairy, is in order to hinder the milk from curdling and growing sour in summer before the cream is taken off; and in the winter to prevent the Dairy from being so cold, as that the milk should be frozen, or that the Butter should be with difficulty

ficulty made, on account of the cream having been chilled.

The dishes being in this manner filled, are twenty-four hours, and sometimes less on the Dairy floor; they are then skimmed; they should not be left longer, because the cream would lose its sweetness, becoming thick, and the milk under it might curdle and grow sour; and where this is the case, no good Butter can be expected.

The skimming is performed in the following manner.

The maid gently raises the dish, laying the lip of it on a large pan, and with her finger's end, she divides the cream near the lip of the dish, in such a manner, that the milk which is underneath, may be poured off into the great pan through this division, leaving the cream by itself in the dish.

All the dishes which were set at the same time, are in this manner at the same time emptied, and all the cream is put together in proper pans, in order to be churned at the appointed hour.

At the time of the year when it is necessary to milk the cows three times a day, this work is to be three times a day repeated, when the milk has been set in the dishes twenty-four hours.

It is necessary to observe, that the dishes being only six inches deep, the cream rises much sooner to the superficies, and is generally all risen in about eighteen or twenty hours, particularly when the coolness of the air in the Dairy, prevents the milk from curdling.

If the weather is tempestuous, very hot, or inclines to thunder, the cream rises a great pace, and the milk will quickly curdle and grow sour, but this must be prevented thus; as soon as the Dairy-maid hears the thunder at a distance, she runs to the Dairy, stops up the vent holes, cools the pavement by throwing down some water, and then
skims

skims all the dishes wherein the cream has risen a little.

In some extraordinary cases, the cream rises in less than twelve hours.

When the milk is thus drawn off from beneath the cream by stooping the dishes, within the space of twenty-four hours at farthest, the Butter-milk which is in the cream is not in the least four, and the same may be said of the skimmed milk. This last being then a very thin liquid, no part of it remains in the cream, so that there will be no danger of the cream souring in four or five days whilst it is kept in the Dairy before it is churned.

They who are acquainted with the manner in which Dairies are managed in Upper and Lower Normandy, may easily judge that their dishes, which are above as large again as those made use of in the country of Bray, cannot be cooled like these latter; that the custom they have of pouring the warm milk into them, absolutely defeats the intention of keeping them cool; that the cream cannot rise to the surface of these large dishes, so quickly as to be taken off before the milk beneath is four; that the custom of leaving these large dishes exposed to all varieties of heat and cold, though either may be in extreme, without taking the least care to guard against the natural bad smell, or dirtiness of the place, are still more opposite to what ought to be done; and finally, that to leave the milk to grow four and curdle, skimming it only once in five, six, or even eight days, and sometimes more, are customs which tend to spoil both the milk and the cream, insomuch that no good consequences can result from them.

Common experience convinces us, that the acid parts destroy those which are more fat, and of greater substance, and that they give the consistence of soap, to what they do not reduce to water; it is also
well

well known in the country of Bray, that the cream taken off whilst it is light, new, and sweet, from milk that is also sweet, yields a larger quantity of Butter, in proportion, than when it is taken off stale, from curded, sour, old milk; the Butter in this last case, is not only in smaller quantity, but it is more rank, cannot be kept fresh, and is by no means proper for salting, which is the principal object of this Essay.

I know several districts in this province (Normandy) where the Butter is good and fine flavoured in spring and autumn, but rank and bad in summer, because the coolness of the spring and autumn, has nearly the same effect on their Dairies, as the inhabitants of the country of Bray, industriously endeavour to cause the whole year round. But when the summer advances, the sourness of the milk spoils the Butter, and makes it of no value, though their pastures are excellent.

We may reasonably conclude, that if they had better management, they would not lose the advantages they might naturally expect from the fine weather of the summer, when the grass is infinitely better, and more plentiful.

I know a farm, the chief profit of which arises from Butter; this farm, when occupied by intelligent and sensible people, yielded Butter which sold for the same price, as the best made in the country of Bray; the land, however, coming into the hands of a farmer who knew but little of this matter, and whose wife was full fraught with the prepossessions she had learnt in the country of Caux, and which she exactly followed during the nine years of the lease, the Butter made in that time, was constantly sold for the worst sort, at a third part less price than his neighbours, and neither the remonstrances of the landlord, nor the loss she every
week

week suffered, could ever persuade this woman to alter her method.

For eight years past, this same farm has been in the hands of a new tenant, an industrious intelligent man, who adopting good methods, the Butter he made, was immediately esteemed the best in the country, and is constantly sold at a price accordingly, in the market at Gournay.

To this farmer am I obliged, for the description of the management of a Dairy which I am now giving.

This anecdote proves, that the advantage of this method, by no means depends on the soil, though it be ever so good.

All the milk that is skimmed, must immediately be taken out of the Dairy, lest it should in any way injure the cream, but this latter is kept four or five days, or even a week, before it is churned; but it is at the same time to be observed, that the less time the cream is kept, the finer flavoured will be the Butter that is made of it.

In extensive farms, where the quantity of cream is too large to be managed in common churns, they use a barrel churn.

One of these consists of a barrel about three feet long, and two feet and one half in its largest diameter, the whole measured from out to out. On each head is an iron spindle, fastened on with a cross to the head, and on each spindle is a winch.

The spindles rest on a horse or stand, made on purpose, of such a height that the women may easily turn the churn.

The iron crosses by which the spindles are fastened to the heads of the barrel, prevent there being any necessity of an axis passing through it, as there must be no iron within side the barrel. The winches are made three feet long, that two, or even

three people may work at each, when the quantity of Butter in the churn requires it.

Within the barrel are two boards, fastened edge-ways, one on each side the aperture hereafter mentioned, to the staves, and running the length of the barrel on that edge, but on the other edge they are chamfered off at the ends, in order to permit the liquid part to pass easily whilst the churn is turning.

One hundred pounds of Butter at a time, may be made in a churn of this size; there are larger, and some on the contrary are less; in other respects, it is not much matter in what instruments the Butter is made, provided there is no intermission in the making. The barrel churn is used for greater expedition, where a large quantity of Butter is made at a time, and any instrument that will accomplish this end, may indiscriminately be made use of.

The cream being put into the churn, the aperture which should be at least six inches wide, is to be closed with a plug, covered with linnen dipped in a lye, which I shall describe by and by, and secured by an iron bar. Over the bar passes an iron pin, which being driven into two staples fastened to the barrel, makes every thing secure.

Four or six people turn the churn, till the Butter is made, which will be in one hour in summer, but in winter will require several hours; this work does not cost much, for the farmer's maids are helped by some poor women in the neighbourhood, who have only a little Butter-milk given them for their trouble.

It is very evident, that the motion of the churn, continually agitates the cream, for every turn it falls twice from one board to the other, and they know when the Butter is made, by its falling in a lump. The Butter-milk is then drawn off through a hole about an inch diameter, on one side the large aperture,

aperture, which hole had, during the operation, been stopped by a wooden plug.

Through this hole, a pail of cold water is poured, by means of a funnel, and the plug being again put in, they continue turning the churn, to wash and cool the Butter. This work is three times repeated, if they would have it well cleaned, and it is left several hours to cool in the last water, that it may be the firmer, if the weather is very hot.

When the Butter is sufficiently cooled, the great plug is pulled out, and the Butter is taken with the hand from the churn, in pieces of two or three pounds weight each, of which lumps of different weights are made, to fifty pounds, by heaping it in a cloth purposely dipped in lye.

The largest lumps are most esteemed, because they keep better in carriage.

They mark the lumps with wooden spoons, and notched sticks, in order to decorate them.

In winter, Butter having no colour, the natural paleness of it is disagreeable to the feller, to the buyer, and much more so to the consumer.

They have discovered a method of giving it the colour that is natural to it in summer, without injuring the quality of the Butter, or infecting it with any taste whatever.

They get a large quantity of Marygold flowers; either double or single are equally good, provided they are fresh gathered.

These are put into a stone pot as fast as they are gathered, and being pressed down, the pot is covered and set into the Dairy.

After some months, all these flowers are converted into a thick liquid, of the colour of a Marygold flower; this liquid they use in winter, to colour their butter; they mix a small quantity of it with some cream, which they put into the churn when they fill it.

Experience teaches them to put the necessary quantity, according to the fulness of the colour they would give the Butter.

This colour is lasting, for the Butter never loses it. Marygold flowers, which give it no bad quality, are known to be alexipharmic and fudorific, but the small quantity that is put into Butter, has no sensible effect.

Of the neatness and cleanliness required in making BUTTER.

Butter is not only apt to stick to what is not very clean, but also to every thing that has been washed well, or even scalded with hot water, if it is not first rinsed with lye, made of fine ashes, or of Roman nettles bruised till they no longer sting; the last are generally used, and every time a pan, cloth, or other utensil, has been employed in the Dairy, either for holding milk, cream, or Butter, they should be rinsed in this lye, before they are again used: and moreover, the mistress, who is generally the person that makes up the Butter, and takes it out of the churn, is obliged to rub her hands and arms with this lye, or the Butter would stick to them.

Of the Uses to which the Skimmed Milk, Butter Milk, &c. are applied.

The poorer kind of people drink the Butter-milk, which is taken out of the churn by way of food; they also make broth of it in the farmer's house for the men and maids, and moisten bran with it to feed the poultry, &c.

The skimmed milk they give to their calves, warm, mixing half water with it. This milk being very thin in body, as the more substantial and nourishing

nourishing part is taken away from it, often gives the calves a weakness, of which several formerly died; but they are presently recovered, by letting them suckle their mother's, which soon restores them to their strength and vigour. This remedy is, however, expensive, as it deprives the farmer of the Butter, which would be produced by the cows milk.

They say, that if the skimmed milk was half mixed with water, in which turneps, parsneps, or any sweet and nourishing roots had been boiled, the animals, so far from contracting a weakness, will grow fat, the juice of these plants in some sort, supplying the place of the fat parts of the milk which are taken away.

I am of opinion, this method might without any risk be tried; but it is necessary to take notice to the country people, that in general, they use copper vessels to heat the milk which they give to their calves; the copper of these vessels deposits in this milk, which is naturally inclined to be sour, on account of its being deprived of its more oily parts, a corrosive quality, capable of injuring young calves, and even killing them.

It would be much safer, if earthen vessels or iron pots were used, as these communicate no bad qualities.

As to such of the skimmed milk as the calves do not consume, it is curdled by art as speedily as possible, lest it should turn sour; ordinary cheeses are made of it, which are used in the farmer's own family, or sold to the poor; finally, the whey which is pressed out of these cheeses, with the skimmed milk that is not applied to this use, serves to feed the pigs withall.

Of

Of the Method of SALTING BUTTER.

Our endeavours should tend towards making Butter fit for salting, as by that means it may become an object of commerce, either in the interior parts of the kingdom, the other countries of Europe; or, finally, for the parts beyond the tropic.

The method we have described gives to Butter the qualities necessary for its preservation, but it must be salted enough to make it keep, which depends on the quality and the quantity of salt that is used, the vessels in which the salted Butter is put, and some other circumstances.

The farmers, not being accustomed to sell their Butter ready salted, they carry it to the markets of such towns where there is the greatest consumption: there every one buys the quantity of Butter that is necessary for his family. The buyer distinguishes that which has the qualities of the Butter made in the country of Bray, from that made in the manner of the country of Caux; he sets a value on one and rejects the other, which is spent fresh in the neighbourhood where it is made.

Butter should be salted as speedily as possible, every delay being prejudicial. It is several times to be washed till the water is no longer discoloured. Grey or bay salt should be used, and not white salt, which is not esteemed good for preserving any thing.

The bay salt is to be dried in an oven and bruised; the washed butter being then spread out, an ounce of the dried and bruised salt should be sprinkled on for every pound of Butter: it should then be kneaded till the salt and the butter are well incorporated together.

The salted butter is afterwards put down into stone crocks or jars of various forms. The jars should first be scalded with boiling water, to get out the
stale

stale butter which soaks into the pores of the earth of which they are made, they are then to be rinsed with lye, in the manner above prescribed for the dairy utensils.

These jars hold from twenty to thirty pounds; the salted Butter is to be pressed down in the jars, and they are to be filled within two inches of the top, after which they are to remain quiet for seven or eight days.

In this time the salted Butter detaches itself from the jar by shrinking in its size, and leaves between it and the jar a space of about a line wide, into which the air would insinuate itself, and spoil the Butter if it was suffered to remain in that state.

In order to prevent this a brine is prepared, made of salt and common water, which must be strong enough to bear an egg, as there would be danger in making it too weak.

This brine being settled, the clear part is drawn off, and is poured on the salted Butter, so as to introduce itself into the vacant space between the butter and the jar, and thence expel the air as fast as it gains admittance; for this purpose it is poured on by little and little, gently moving the jar, till the brine is at least an inch above the butter. The air cannot, after this is done, approach it on any side, unless the butter floats in the brine. In this case a weight must be laid on it, in order to sink it, and thereby prevent the air from causing it to decay.

This is the method of salting Butter, which we practise all the year round at Rouen: it is used in the best families, and serves to make pastry, which the most delicate palates cannot but approve of.

All Butter salted in this manner, and put down in stone jars, with a sufficient quantity of brine, will be equally good with that of the country of Bray, which we have described; for the keeping
well

well of the Butter depends on its not having been injured by the acidity of the sour milk, and on the jar being made of good earth, and its being well scalded and rinsed, as we have recommended, with the lye, so as not to communicate any bad quality to the Butter.

When this commodity is to be carried to any distance, the brine cannot be kept in the jars; to supply the place of it therefore, they cover the Butter with salt to the thickness of an inch.

This method does very well, provided the Butter is not long without brine; insomuch that Butter, properly made, and which after being salted, is carried into the several parts of Normandy, and even to Paris, if brine is but put on it when it comes there, will be very good.

But this will not do for Butter intended for exportation or ships provisions. It is very difficult to stow any considerable number of jars on account of their being subject to break; hence came the custom of putting up Butter in firkins or tubs: but whether it is put into firkins or jars, it is impossible to keep it covered with brine if the ship passes the tropic.

In order to remedy these inconveniences it will be proper to season the wood, of which the Butter tubs are made, to keep it from shrinking, and from the fermentation to which it is subject in hot climates, when the tubs are greatly heated in the hold, at which time the sap ouses from the wood, mixes with the Butter, and makes it rank, notwithstanding it has been well salted. The same fermentation also lessening the volume of the staves, the brine runs out, and the Butter is soon spoiled.

It is not impossible to find a remedy for this, and to do it would certainly be of infinite use, as it would probably be a means of making all sorts of sea provisions keep better, which would greatly contribute

contribute to preserving the life and health of sailors, an object of no small importance.

In order to preserve Butter on shipboard, it should be well put down in jars, shaped like a frustrated cone the base uppermost, or rather like a perfect cone, the base uppermost, out of which the Butter might easily be taken in a single lump.

The lump of Butter being covered on the outside with salt, and then pressed down into its jar, might in this condition do without brine, because the jars resting on the point of the cone, the lump of Butter would sink towards the bottom as fast as the size of it might be lessened by the heat of the hold; by this means there would never be any vacant space, except on the top, which should be covered with salt.

Wooden tubs might be made in the same form, so as to answer the same purpose, provided the wood they were made of was well seasoned; but the greatest pity is, that these tubs could not be conveniently stowed in a hold.

In general the pasturage of the greatest part of Normandy seems to surpass that of the country of Bray, if we may be permitted to judge by the nature of the soil, and the dung that is left by grazing animals.

If any means could be discovered, by some encouragemens given, of introducing a good method of making Butter into such parts as now make so wretchedly bad, the salt Butter which comes to Rouen from Isigny, and other parts of Normandy, would not be entirely abandoned to the consumption of the poor.

If this was the case we may presume, that Butter would become a capital object in commerce greatly to the advantage of those who possess extensive pastures; for even at this time there is not a cow but what brings forty shillings clear profit to its owner.

after all expences are paid, putting entirely out of the question the great encrease of profit that might be expected from dealing in Butter of a superior quality, fattening calves, and even the cows.

It is well known, that fattening oxen does not bring so large a profit to the graziers by far; whence we may conclude, that it would be very advantageous to farmers if they kept more milch cows.

This advantage would subsist till the quantity of Butter made was in proportion to the demand; and even afterwards it would always continue a capital branch in agriculture, as it would keep us from the necessity we now are under of purchasing such quantities of foreign Butter.

I have been by so many persons requested to write this Essay, and by such as are seemingly eager to adopt the methods prescribed in it, that I am in hopes its utility will in time be felt not only by the dairy-man, but also by the farmer and the land-owner.



A R T I C L E. XXXII.

An Essay on the planting of the resinous Pine Tree, on the seemingly barren Parts of the Royal Forests, on sandy Plains and Heaths, compiled from the Papers of the late Mr. RONDEAUX, of Rouen in Normandy.

T H E consumption of fire-wood, in the city of Rouen, is so much increased, that the inhabitants are with great difficulty supplied with a sufficient quantity of it.

This important object engaged the attention of M. Pecquet, Intendant-general of the forests, from
the

the instant he was appointed to that office. He endeavoured to find out the means of making some advantage of 3000 acres of land in the forest of Rouvray, which were not of the least use.

The plan he had for this purpose laid, was seconded by an arrêt of the council, dated February 17, 1750, which ordered four hundred acres of this land to be replanted with birch-trees, and 300 more to be planted every succeeding year.

The success it has had, has sufficiently proved the propriety of the scheme; and we may even say, that it has surpassed the hopes that were entertained from it; for in the winter 1756, they were obliged to cut the 400 acres planted in 1750. The produce of this cutting was as large as could be wished; but notwithstanding the care that was taken in making these plantations, all parts did not succeed alike. The soil is so very dry in some quarters, that though the greatest diligence was used to supply the places of such plants as died; yet after all, some spots remained bare.

M. Roudeaux, who for near twenty-eight years, had by the office he enjoyed the care of the forests about Rouen; undertook the superintendence of all this work.

He made it his particular study to find some method of again stocking this whole tract with wood.

The experiments he made, and the instructions he received from various parts, convinced him that this might effectually be done, by planting the resinous Pine-tree in such parts as were incapable of bearing any other tree.

The truth is, all the instructions he received agreed in one point; namely, that the most sandy and dry soil was best adapted to the growth of the Pine-tree.

In order to compass this end, without breaking up the soil, and preparing the land as if corn was to be

sown ; some very fresh seed of the Pine must be procured, which should be sown in the months of February or March ; as to nurseries they are entirely out of question, for Pines will not bear transplanting.

M. Roudeaux having received these instructions from the country of Guyenne, the heaths of Bourdeaux, and the sandy soils about Olonne, was willing to try what success he might hope in the affair.

For this purpose, in the year 1756, he got some new Pine seed from Bourdeaux. His principal experiments were made in two places, where the soil seemed but little adapted to bearing wood ; one was in the forest of Rouvray, and the other in the estate of Madrillet, which is contiguous to it, and where the proprietors gave him leave to break up twenty-five or thirty perches of land.

The seed came up very well ; the Pine-trees are very thick, and experience has convinced M. Roudeaux that the worst soils, and such as are absolutely esteemed good for nothing are best suited to this tree.

The utility of Pine-trees is well known ; and, indeed, they are so generally used, and so necessary, that but for this resource, half the province of Guyenne would be uninhabitable. They make of them vine props, laths, masts, and yards ; they use them also for building, and for all sorts of carpenter's work.

When they are twenty years old, they begin to notch them, in order to extract the gum or resin, of which they also make much oil of turpentine and pitch ; this is continued for twenty years. The resin also makes candles for the common people. One man may take care of four or five thousand trees, which will yield 100 or 120 quintals of resin yearly.

When these trees produce no more resin, they are

are burned to make pitch and tar for caulking and paying ships bottoms.

The wood, when it is dry, burns very well, and the bark being stripped off, is proper for tanning; the wood may also be burnt into coal, the blacksmiths find that the iron works better with that than with stronger fuel.

Many people have consulted Mr. Rondeaux, with respect to the advantages that may be made by planting this wood; in consequence of which they made several experiments, which convinced them of its utility, so that there is not the least doubt but that in a little time all the heaths, dry commons, barren hills, and other poor lands will be stocked with this wood, which could not fail being every way productive of great advantages.

All this might be done with very little expence either of time or trouble, for the Pine tree requires no culture, as it will sow itself; and the first purchase of the seed will amount but to a trifle.

[It should seem from the above essay, that the Pine tree would thrive well, and might, to great advantage, be planted on Hampstead-heath in Middlesex, the soil of which is very sandy, and turns at present to but little account. Putney-common and Wandfor-common might also be planted with Pines, which places being so near the metropolis, the timber would be of great value, not only for masts and yards for the shipbuilders, but also for building. A great deal more land in the counties of Middlesex, Surry, Kent, Hertfordshire, and Berkshire, all convenient for the metropolis, might to advantage be planted with Pines.]

ARTICLE



ARTICLE XXXIII.

An Account of an Experiment of sowing Lucerne on a Stubble, made by M. TSCHIFFELI, Vice President of the Œconomical Society at Berne.

I HAVE hitherto been of the opinion generally received, that Lucerne requires a soil well manured, and properly prepared, a considerable time before the season of sowing; but as I have made it a rule, never to adopt any thing in matters of agriculture which I know not to be true, either from my own experience or from that of others, whom I know to be intelligent and of veracity, I last summer, 1763, made the following experiment.

I had a field containing somewhat more than an acre, the soil of which I knew to be excellent, being neither too strong nor too light. After having been well plowed and manured, it had this year yielded a plentiful crop of wheat without any mixture of weeds.

All these circumstances put together induced me to imagine, that I might, with some probability of success, sow Lucerne upon this stubble.

What farther encouraged me in this attempt was, the knowledge I had that this soil, of a middling nature, that is neither too strong nor too light, was continued to the depth of about five feet.

As soon as the sheaves were carried off, I caused this field to be plowed in narrow furrows as deep as possible. The small portion of darnel that was mixed with the stubble was then picked out, and the clods well broke.

Finally,

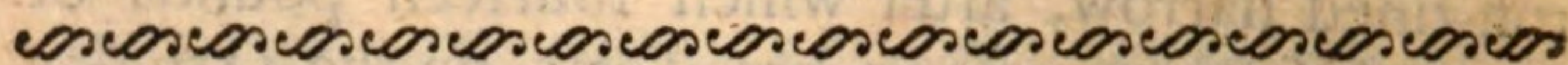
Finally, the land was laid very level with a heavy iron-tined harrow, after which fourteen pounds of Lucerne seed were sown broad cast, on the 11th day of August, in calm weather, and the seed was covered by means of a light harrow. A mild rain, which fell two days afterwards, greatly conduced to the success of my experiment.

At the end of nine weeks the young Lucerne plants were a foot in height, equally thick in all parts of the field; and some good judges allowed, that they were as fine as any reasonable man could wish.

I shall not, however, this autumn venture to cut it, being of opinion, that in order to strengthen the roots it will be best to let the plants rot on the ground, and to cover them till spring either with straw or long dung.

The event will shew how far I am in the right, and I shall not fail, in due time, communicating it to the public.

[If this Gentleman's experiment should meet with success throughout, it will be a great inducement to farmers sowing Lucerne, as what in general deters them is the great expence of preparing the land for the reception of the seed. If, however, this useful plant can with any probability of success be sown after corn on a single plowing, it must be deemed a great improvement; but we must remark, that if the English farmer means to sow it after wheat, he must sow his corn early that it may be early ripe.]



ARTICLE XXXIV.

An Experiment to make Lucerne thrive in a poor Soil without Manure, by the same Gentleman.

I caused the turf of a worn out pasture, containing about half an acre of land, to be raised with a paring plough. When the turf was half dry, it was piled up in little heaps, about two feet high. Each heap was then set on fire with the help of some faggots and dried peat turf. They were then covered, and the turf, in this manner, insensibly mouldered. This is by much the best method.

The ashes of the burnt turf were afterwards spread as equally as possible over the soil, and the whole piece was dug at least a foot deep.

After being laid level, the Lucerne seed was sown and harrowed in.

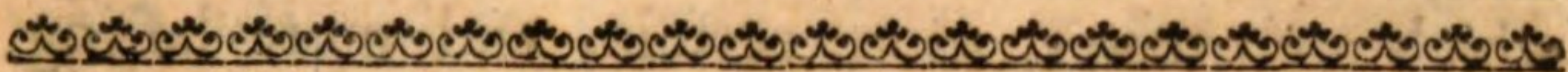
Though this land was far from being of a good quality, having a mixture of a whitish clay, yet the Lucerne prospered very well during the whole summer.

The seeds of the darnel were burnt by the fire, so that the crop was not injured by this weed, and I had two cuttings last summer.

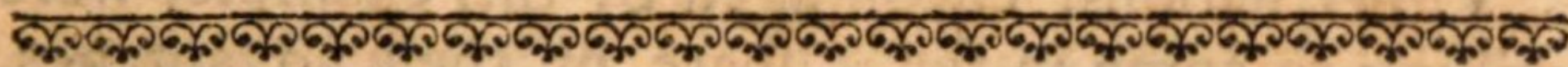
This method may then probably be of great advantage to such farmers as have lands of a like quality; but as this work requires time, and is more expensive than where the turf is not to be burnt, I will not venture absolutely to recommend this practice, particularly as I am not yet certain whether this piece, though it has prospered so well hitherto, will continue to do so for any length of time.



FOREIGN ESSAYS, &c.



N U M B E R IV.



ARTICLE XXXV.

To the AUTHORS of the Foreign Essays on Agriculture and Arts.

GENTLEMEN,

I Now mean to fulfill the promise I made you in my last letter by enclosing a curious essay written by Mr. Engel, of Switzerland, on the famous question of the Nourishment of Plants by the same, or by various kinds of sap. I beg leave to recommend this to your notice, and request that you will afford it a place in your work as soon as you conveniently can.

I am, Gentlemen,

London, April 16,
1765.

Your very humble Servant,

R. BRENNAN.

An Essay on the Question, whether all plants extract from the earth the same nutritive juices. Written by Mr. ENGEL, President of a Committee of the Oeconomical Society at Berne.

EUROPE, astonished at the immense trade of the English, at their successes, their power, and their wealth, has at length enquired into the cause of this

NUMB. IV.

I i

superiority,

superiority, and it was immediately discovered, that this prosperity was chiefly owing to the encouragements given to agriculture in all the three kingdoms.

Some zealous citizens, either separate or united in societies, have applied themselves to the study of the principles of this most useful art. The government, the parliaments have protected them by regulations, and encouraged them by rewards; and these united efforts have secured to this nation advantages which are greater, more certain, and more lasting, than those derived from the mines of Peru.

Other nations, encouraged by this example, were willing to come in for a share of these advantages. Academies were in every part established, and we had the pleasure of seeing learned, curious and industrious men, who, supported and encouraged by the princes and magistrates, made experiments, proposed schemes, and established rules for extracting from the earth, our common mother, every kind of production. And these philosophical husbandmen have been the rather induced to write on these subjects, by the delicacy of their sentiments, perceiving the advantages that would result to mankind in general from their endeavours; and they moreover continually find, in the study of nature, reasons for exalting the infinite wisdom of the creator, and a variety of knowledge capable of satisfying their extensive desires.

It may easily be conceived how vast the field is, from the questions which have been published by our Society.

One of these questions is indeed of the last importance, though intelligent husbandmen are much divided in their opinions relative to it. The question is, Whether all plants require the same kinds of juices, of salts, of food; or whether each is nourished by a different substance.

Mr. Du Hamel, who puts this question, gives
no

no positive answer to it; others are for the affirmative, many for the negative.

I will not venture absolutely to decide in this matter. I shall content myself with proposing my doubts, leaving my observations to be examined and judged of by the intelligent reader.

Be it as it may, the negative appears to me most consistent with experience; and I think I have observed, that a soil which is exhausted of the nourishment adapted to certain plants, is not so with respect to others.

I shall begin with laying down a few principles.

FIRST PRINCIPLE. The ancients have established four elements, Fire, Air, Water, and Earth. Des Cartes proposed three others, which, on account of their novelty were at first received, but were soon afterwards dropped.

Chemists who are employed in searching for the elements or principles of which various bodies are compounded, have in general specified three, namely, Salt, Sulphur, and Mercury. Others have added two more, Phlegma and Caput Mortuum, which last some call Earth,

Others again exclude Mercury, which they say is nothing more than dilated Sulphur.

We know what is meant by Salt. As for Sulphur, they mean by it the oily and phlogistick or inflammable particles. By Mercury they mean the spirituous particles. I do not see how these two last principles can be confounded and identified, they rather appear to be opposite. In analyfation the spirit and the oil do not mix, but always remain separate. The Phlegma is pure Water divested of all the other elements; and the Caput Mortuum is an earth divested of and detached from all the other principles.

Such as admit of only three principles, and the others who allow of five, appear to me to differ only

in expression. The three first are the only active principles, the two last being merely passive.

If then we will admit into the rank of chemical principles only active and efficient causes, there will be but three; but if we reflect that every agent is useless unless it has some recipient, some passive substance on which it may act, we must acknowledge, that the two passive principles are as necessary as the others, and equally merit a place amongst the elements.

SECOND PRINCIPLE. There is undoubtedly a very great analogy between animals and plants. Formerly the animal was thought to be as far removed from the vegetable kingdom, as this last is from that of minerals.

For a long series of time what was said relative to the Palm or Date tree was esteemed a fable, namely, that there was a male and female, and that the assistance of the male was necessary to fecundate the female. How were they ridiculed who first discoursed of the fecundation of plants by the dust of the male flowers, but at present nobody entertains the least doubt of it.

The celebrated Linnæus points out to us an infinite number of different sexes more amongst plants than amongst animals. He describes their various constructions, he shews their farina fecundans, their ova, their receptacula, &c. insomuch that it can henceforth never be denied, but that there is a great resemblance between animals and vegetables. This is a principle of which we should never lose sight.

THIRD PRINCIPLE. There is an infinite variety amongst plants; they all differ much in their structure and in their composition. The stems are more or less succulent and soft, hard and ligneous, compact and porous, pliant and stiff. The fruits vary in shape, taste, smell, and colour; the leaves are
also

also very various. The diversity is still greater in the flowers, where all imaginable colours, shades, and mixtures are seen. The juices in the plants are not less different: we find many of them wholesome, others hurtful, and some even poisonous. In some plants vitriol predominates, in others nitre, in some sulphur, in others salt. Some again contain all these various principles in a more equal proportion.

FOURTH PRINCIPLE. Nitre and nitrous particles contribute much to the fertilization of the earth.

I am sensible that this principle is not universally adopted. There are Naturalists who assert, that all salts being composed of sharp and cutting particles, and being very susceptible of moisture, in no sort contribute to vegetation, but by dividing, dilating, opening, breaking, and stirring the earthy particles, and insinuating themselves into the pores of the earth.

Others go still farther, and contend that nitre, and particularly common salt, rather contribute to make land barren than fruitful. An effect say they so well known by the ancients, that when any town was marked out for destruction, they razed it, plowed up the ground it stood on, and sowed it with salt; giving us thereby to understand, that the spot was neither to be inhabited nor cultivated, and that it was not for the future to bear even a plant.

In these various opinions we find both true and false positions; we will endeavour to distinguish them.

In the first place it is certain, that nitre used in excess is prejudicial to plants.

The garden belonging to the castle of A. is a terras, and the castle itself stands on a still higher terras. At the end of one of the wings, where the stable is situated, is a border. This stable, though it is often

often cleared, abounds always with salt-petre, which descends and penetrates into the earth.

Though this border was in a fine exposure nothing would thrive in it. I caused the earth to be taken away, and some fresh mould to be put in the stead of it. The plants then prospered very well in it. Two years afterwards they all died, on account of the nitrous particles which were now found there in too great plenty.

Another experiment. I caused some pots to be filled with mould, which I imagined very good; the plants I put in them languished and died. I was entirely ignorant of the cause, till having watered them several times, I perceived glittering on the sides of the pots exposed to the heat of the sun, crystallized particles of nitre.

By this it is evident, that nitre is sometimes an enemy to vegetation, and we must not be surprised at it.

All manures, even those that are best adapted to promote fertility, as dung, parts of animals, &c. which assist vegetation in so remarkable a degree, when they are used in proper quantities, are nevertheless very prejudicial when used in excess.

I have somewhere read, that a certain Gardener had in his ground a monstrous cabbage, which raised admiration in every one who saw it. They could not conceive by what means it attained so extraordinary a size, till in digging the ground, they found that the root had fixed itself in an old shoe.

I am also acquainted with some meadows, which are frequently by art flooded by the waters of a brook which washes the town slaughter-house. These meadows yield so large a quantity of hay, that the like was never before seen in any other part of the country.

Every fourth year the hay grows coarse, having hard stalks, which greatly lessen the value of the fodder,

fodder, infomuch that the owners are obliged to plow up these meadows, and fow them for three fucceffive years, in order to abate their ranknefs. After this the hay is again fine, of a good quality, and amazingly plentiful.

As to Nitre in particular, I have frequently used it with fuccefs, and it greatly promotes the vegetation of plants, if it is applied with caution.

From these collected facts I conclude, that Nitre is useful or prejudicial according to the application that is made of it.

But we must guard againft mistakes, for common falt has not the fame qualities as nitre, and does not in fo great a degree affist vegetation. Common falt, as well as all other falts, if they are properly applied, loofen and feparate the particles of the earth, fo as to adapt it to the reception of vegetables. But nitre, fea falt, and all falts in proportion as they participate the qualities of nitre, have a neutral falt in their fubftance which contains not only an acid but an alkali, together with a phlogiftick, or inflammable oil, and a fine invifible and impalpable earth, which ferves as food for plants, and to which water ferves as a vehicle to convey it into the pores of plants.

It is this matter which renders manures from the animal kingdom fuperior to all others.

Some may imagine no earth can be invifible; what can be clearer than the chryftaline water of a fine fpring? It has however been demonftrated, by numberlefs experiments, that it contains this earth, which is the principle of all vegetation; it was therefore invifible in this water which was fo clear and limpid.

FIFTH PRINCIPLE. The chemifts extract from all material beings, falts, oil, and a fpirit, which are the active principles of corporeal fubftances; but we may obferve at the fame time, an aftonifhing difference

ference in the taste, the nature, the properties and the effects, of these principles; yet how few are they, in comparison to what we are ignorant of?

I have not the least doubt, but that there is among these salts, oils and spirits, as great a variety as there is amongst the different kinds of animals, and even of plants; these are however unfathomable depths, which as frequently occur in agriculture, as any other science.

We will now come more immediately to the matter in debate.

Hitherto it may easily be perceived, that I incline more to the opinion of those who imagine that every plant requires a different nourishment, than to that of those who conceive that they are all nourished by the same food.

No thesis on this, or indeed any subject, should be positively and exclusively supported against all other reasoning. I admit of exceptions, restrictions and distinctions. The opinion I am most inclined to favour, is that advanced by Mr. Home, in his Principles of Vegetation, and that which I controvert, is the same which Mr. Du Hamel seems most to approve of.

The third and fifth Principles appear to me to demonstrate, that there should be a real difference betwixt the food of different plants which vary much in their real and accidental parts, in their salts, their oils, and their spirits, and in a word, in their very essence.

By the second Principle it is incontestable, that as there is a visible analogy betwixt animals and vegetables, the nourishment of vegetables must of course be more different than is that of animals. Some animals are carnivorous, others eat feeds, fruits and roots; many feed on grass, and what a difference is there even amongst these last.

Horses

Horses, oxen, sheep, asses, and goats, in general live on the same food; but it has been remarked, that some eat with eagerness those plants which others refuse, and that certain plants which are poisonous and injurious to some animals, are wholesome and palatable to others.

Some will feed on any thing. Hogs eat flesh, blood, fruits, corn, and grass, they refuse nothing.

I imagine it is the same with plants. Some not being very delicate indiscriminately receive all kinds of juices; others are fed by only some particular kinds, and so far reject others, that they pine and die, if the earth in which they are planted happens to be exhausted of the juices they require.

I have made several experiments in this matter. Some plants have not succeeded in a soil where others have thrived amazingly. It is not that these plants required a great quantity of nourishment; for the land was very good, but it had not the quality the plants required.

Some plants are so voracious that they naturally imbibe all kinds of juices and salts: if their proper food is not at hand, they will take some of a nature inferior, nay sometimes hurtful.

Oxen, horses, sheep, &c. are fond of grass either green or dried; for want of this fodder they feed them with straw, and sheep with leaves of trees.

In time of war or scarcity we have been frequently obliged to feed our cattle with half rotted straw or stubble that had been used for thatching. No one can say this is their natural food, neither can it be at all times recommended. Dogs are not fond of fish, and much less dry than fresh: yet we learn from the relation of travellers, that the inhabitants of Siberia, who use great dogs in their sledges, lay up no other provisions, either for themselves or their dogs, but dried fish.

The diversity in the food occasions also a diversity in the effects. Different salts and dungs occasion great differences in the taste and colour of plants, of their fruits, of their flowers, and of their properties. This is a well known truth.

Skilful Gardeners well know what manures they should use to give a good taste to their pulse, and what on the contrary they should avoid, for fear of giving the plants a bad taste.

It may not be amiss to give a few instances of this, they will serve at the same time to prove that the quantity and quality of a food, to which the plants are not accustomed, produce astonishing effects, and hasten their destruction.

A friend of mine, who is yet living, assured me, that having an inclination to plant some maize or Turkey corn, he collected several sorts of dung, such as that of cows, horses, sheep, goats, hogs, pigeons, poultry, &c. of which he made a steep. In this he steeped his seed till it swelled. The maize was all of the whitish yellow sort. At harvest there was a perfect variety in the corn, a light and dark blue, a red, with a whitish and full yellow, being visible on the feeds; and the sheaths of the stalks were of all these colours.

The same thing happened to me a short time since. I caused some of this seed to be planted, all of the yellow kind, in a piece of land where formerly all kinds of dung and filth had been thrown; and I had the same variety in the feeds at harvest.

Florists observe, that the variegated tulips are never so fine, nor so much varied, as when the bulbs of the roots are ready to perish; whence they conclude, that this great variety in the colours is a disease. They seem to me to be in the right. Bulbous rooted plants require more nourishment than those which are fibrous rooted; they imbibe and receive every kind

kind of moisture and liquid, together with all the juices and all the salts which these liquids contain.

It happens to them, as it too often happens to men, that intemperance, excess, and a variety of food, bring on diseases and death. Every year the most valuable bulbs are taken up and replanted: the earth can never be so equally prepared as to contain the same juices, the bulbs of the flowers feed on them all; in the end however they languish, and perish prematurely.

Another fact serves to confirm this argument. If the bulbs of tulips are left many years in the same soil without being taken up, the flowers become either wholly red, yellow, or sometimes white, according to their original colour; at last they grow small, their petals pointed, with green edges. The reason for this may be discovered in the preceding observation. As soon as the variety of juices is exhausted, and that only the grosser and more ordinary kinds are left, the variety of colours is of course at an end: finally, these last are so far exhausted, that they cannot produce perfect flowers, either in point of size, shape, or colour; the colour of the leaves, which are satisfied with ordinary food, mixing itself in the flowers.

The violet and the gilly-flower may be variegated by nitre, or by any nitrous substance: by lime rubbish, marl, ashes, &c. It may perhaps be alledged that this is a proof that plants are indiscriminately nourished by the same juices: but I say, that this is a disease occasioned by a super-abundance of nutritive juices, or by their being of an opposite nature.

A curious fact related by M. J. Aug. Grotian, Avocat of the Imperial town of Nordhausen, in his treatise on the culture of violets, pinks, and auriculas, will serve as a proof of this assertion. "With a lye made of sheep's dung, I have, says he, changed a red violet into a mottled colour: it was a plant

with single flowers, and full blown. It grew in a middling sized pot, such as is generally used for pinks. I made the experiment after sun-set, and finding the earth required a good watering, I put the pot into a tub full of lye made of sheep's dung, in such a manner, that the liquor was a little above the edge of the pot. I left it there for twenty-four hours, after which I set it in a place where the superfluous liquor might drain away. In about an hour I found that all the flowers were very elegantly mottled, but in a few days afterwards the plant languished and died." This instance shews the effects of too great an abundance of such nourishment as the plant had not been accustomed to.

If this water, impregnated with sheep's dung, had not been too plentifully applied, or if it had been lowered by other mixtures, or by plain water, the plant might possibly have supported it. But its constitution could not resist this plethora, occasioned by so succulent a food so plentifully applied, and which it was forced to imbibe on account of its dry state. This is like what is said of a Lady of quality, who hearing of some people being starved to death, seemed much surpris'd at it, asking why these people did not eat bread and cheese rather than be starved; which food she herself would be content with if she could get no other.

It is also remarked, that the same plants do not thrive equally well in all places. Some thrive best in vallies, others on rising grounds, and not a few on mountains. Some again prefer dry situations, whilst others grow best in moist grounds. Some grow in springs of clear water, but others thrive best in putrid water, growing most luxuriant in muddy marsh ditches. Does not this difference manifestly proceed from the different juices contained in these different soils?

Some

Some may attribute it to heat or the air; but the degree of heat has very little or no influence in this matter, for it would be very easy to find places equally hot or cold. The air might indeed have some little influence, but it appears to me, that the whole may be attributed to the quality of the soil.

I must here refer to an excellent Essay, written by M. de Graffenreid Lord of Worb, on the culture of exotic trees.

The Chamœrhododendron, and several other Alpine plants, were so difficult to be cultivated in gardens, that some have asserted it was impossible to make them succeed. He has, however, found the secret of doing it, without borrowing either the sun or air of the Alps, only by endeavouring to prepare the earth for them, in such a manner, that it may as much as possible resemble their native soil. Who then can assert, that all plants extract the same nourishment from the earth?

An experiment I have made, though less fortunate, evidently confirms what is above related.

I had a mind to remove some very fine plants from the Alps into my garden. None of them succeeded. I found that the difference of the soil was the occasion of it.

I then procured and planted some *Silene à caulis*, preserving a globe of earth about the root of the plant. This fine plant thrived very well whilst it was nourished by its native earth; but soon after it was transplanted, notwithstanding all the care I took, it died.

The improvement of land by marl, in like manner, supports my system. It is well known, that this manure, in a greater or less degree, abounds with alkaline and nitrous particles.

It is of infinite use in arable land, for being mixed with the soil by the plough share, it pulverizes the earth by its salts, destroys the weeds on the land,

at

at the same time yielding corn with strong stalks, large ears, and sizable, heavy, well-fed, and perfect grains.

Since therefore marl destroys certain plants, and gives an extraordinary vigour to others, how can it be said, that all plants require the same nourishment? But to go still farther, it is well known, that if pure marl is applied for any length of years, the soil will be impoverished so as to bear nothing. What reason can be assigned for this sterility? I can readily discover it in my hypothesis.

Marl contains, in any plentiful degree, only one kind of salt; insomuch that the others can scarcely be brought in comparison. Now plants, having occasion for different salts in a greater or less degree, exhaust the soil of these other salts. After this, only that kind of salt remains with which marl abounds, and this is not alone sufficient to afford nourishment to plants, which require a mixture of salts.

It is on this principle that, to remedy this inconvenience, they do one of these two things, either mixing the marl with dung, or else, after having used, for three or four years, marl alone, they dress the land with dung alone. In this method they get amazing crops. And what is the reason of it? It is on account of the plenty and variety of salts contained in the marl and dung, by which the plants are supplied with all the nourishment they require. Amidst this plentiful variety of food, they may prefer that which is best adapted to their nature, and in such a proportion as will satisfy their wants.

I shall now explain my idea by an imaginary calculation.

Let us suppose ten sorts of plants, and that these ten sorts should require twenty kinds of salts or juices.

One will want ten-twentieths, another five, another four, another three, another two, and another one-

one-twentieth of one of these kinds. Here then are twenty-five-twentieths. Thus we find a deficiency of five-twentieths of this kind of salt, to afford the plants food in proportion to their nature and their wants. What must then be the consequence? Doubtless the plants which require the largest quantity of one particular kind of juice, having their organs better adapted to attract and imbibe that juice than the other plants which require less of it, will engross the whole quantity, to the loss of their neighbours, which will die if this food is any ways essential to them, or at least languish.

But what will be the consequence if of ten plants growing in this soil, four should require ten, twelve, or fifteen-twentieths, and that of course there would be a deficiency of two-thirds of the necessary nourishment? Must not two or three be overpowered by the rest, and absolutely perish?

By adopting these principles, we may give a very simple solution to a phenomenon, which the ancients could no otherwise explain than by the terms sympathy and antipathy of plants.

One plant requires eight-twentieths, another five, a third four, and another three-twentieths of one same kind of nutritive juice; the other part of their food being extracted from various substances which three of them have no share in. All thrive and prosper; this is a sympathy. But when, according to the above-mentioned supposition, the contrary happens, and that one plant robs another of its food, it is called antipathy.

How comes it to pass sometimes that a poisonous plant and it's antidote will grow in the same place, and often very near each other? Can we persuade ourselves, that plants of so very contrary natures imbibe the same juices?

We shall give a few more instances; experience should be our only director.

All

All florists know that no mould is more proper for the bulbs of hyacinths, tulips, &c. than some wherein cabbages, and other pulse grew the preceding year. Whatever quantity of food these so succulent plants may have required, there will still remain sufficient for the bulbs of flowers which require but little less; it must then necessarily be a juice of a different nature from that required by the pulse.

But farther, florists recommend to us never to plant the same kinds of bulbs for several successive years in the same place, but to change them for other sorts. Does not this practice shew, that they do not suppose the earth impoverished, but only exhausted of that kind of juice which was required by one sort of bulb.

If this is the case with bulbous plants, which have a greater analogy one with the other than the numberless perennial and annual plants, we may easily judge, that there must be still a greater difference in these last.

Let it not be said that I contradict myself, because I have observed above, that bulbs, and amongst others, tulips, imbibe all juices. I admit that there are plants which take in all kinds of food, but it is for want of better. If they meet with such as is best adapted to their nature, they quit that which is less so, and take the best.

I shall now mention another experiment. I have observed in an arable field, which had been sown two years with bere or square barley, that at the third sowing with rye, the *Hypericum perforatum*, St. John's wort, would make its appearance, and increased so much in the year of fallow, as to cover the land. Can it be said, that as fast as it grew the seeds dropped and multiplied the plants? This explanation cannot have place, because the second year after the land was laid down to grass, a very small

small quantity of this plant remained, and still less and less every year.

This fact can no ways be explained by any other system, except that which I adopt. The St. John's wort found very little nourishment whilst the bere was on the land; more when the field was sown with rye; but when there was only a little grass on the land, this plant took possession of the whole. In the end, however, notwithstanding the prodigious encrease of its seeds, the grass encreased and killed it.

The same thing is observed in the different kinds of grain and land. Sometimes wild mustard appears, at others cockle and blue bottle. These plants unfold their parts, germinate, shoot, and grow when they meet with juices adapted to their nature; but they remain in a state of inaction when they are deprived of these juices.

I shall give another instance, which, in my opinion, should decide the question.

M. Reichard, one of the principal magistrates of Erford, has diligently applied himself to the study and practice of agriculture. He had the advantage of his father's example. He says that for eighty years past (in 1754) both one and the other of them have endeavoured to lay aside fallows, and to plant or sow the same land for several successive years. His father accomplished it for twelve years, and himself for eighteen. How came they to think of doing this? In a work published in German by the son in five volumes, called, *The Treasure of Agriculture and Gardening*, the following is laid down as an incontrovertable principle.

"It is certain, says our Author, that every fruit and plant only extracts from the earth the salts and the substances which are required by its nature and essence, and on the contrary rejects and leaves those which are required for the vegetation of other plants. This requires no very extensive proof, because the

truth of this principle is within the reach of our senses; being evident to our sight, our taste, and our smell. It is manifest that an onion has extracted from the earth juices very different from those extracted by a carrot. It is in the same manner apparent, that those kinds of pulse which form themselves in the earth, have not extracted from the field the same particles as the poppy, anise, bastard saffron, and other plants of the same nature require, because they chiefly consist of oily particles."

From this our Author draws a conclusion which becomes a second principle. "We may, says he, hence conclude, that when a soil is exhausted of all the juices proper for the support of a certain crop, so as not to be able to support the same crop another year, it may still have strength enough left to support other plants or fruits.

For this reason crops should be varied as much as possible, not only in gardens but in fields, and by cultivating them in successive order, they should be in such a manner interchanged, that the same crop should not be repeated till the earth has had time to recruit its strength, and collect a fresh quantity of those salts which are best adapted to the vegetation of the particular plants in question.

If it should be asked, how a soil which is exhausted of certain salts, can, after resting as far as relates to one crop, collect a fresh quantity of the same salts which this particular plant requires, without any new manure being applied, I make answer, that in my opinion these salts are anew collected in the earth from the rain, snow, and dew, principally from the dung which remains, and is dissolved by slow degrees, being prepared for the vegetation of these particular plants."

On these principles have Mr. Reichard and his father acted for eighty years. They made it their study to find out what plants were best adapted to succeed

succeed one another. This study is of such real importance, that others being willing to imitate them without having any knowledge of this succession of crops, have never been able to succeed, yet knew not to what cause they should attribute their bad success.

If we reflect ever so little, we shall conceive that these thoughtless imitators inconsiderately sowed or planted seeds which required, in a greater or less degree, the same kind of juices and salts.

Mr. Reichard, who, as well as his father, had for many years studied the nature of plants and their nourishment, sowed with discretion successively the several sorts of seeds. In this manner the earth might, in one sense of the word, be said to be in repose, collecting fresh juices for plants which could not do without them, whilst it supported other plants with the juices the first had no occasion for.

I am apt to think no other possible reason can be assigned for this.

Perhaps in relating the method pursued by Mr. Reichard we shall find an opportunity of making some useful remarks.

1. He lays the first year thirty loads of dung on every acre, which is turned in by the plough before winter, or what he greatly prefers, the spade.

Remark. We must in this place observe, that thirty loads being three times as much as is generally laid on an acre, it is not at all surprising, that the soil should long continue in heart: but besides, that this cause cannot subsist above three or four years, we must pay some attention to the plant it is to support the first year.

2. The first year he plants all sorts of cabbages and lettices.

Remark. Every body knows that these plants when cultivated in gardens require a great quantity

of manure, and should we calculate how much was laid on the beds where they grow, we should find it greatly to exceed the proportion of thirty loads per acre.

3. The second year he sows onion seed; or, if the quantity would be so large that vent cannot easily be found for it, he recommends the planting of cabbages once more, or of radishes and cucumbers. He says that the soil not being yet exhausted of the salts adapted to the vegetation of the cabbage, that plant may be hazarded a second year.

Remark. Cabbages are frequently planted several successive years on the same spot, but then the land is fresh dunged every year. Here no fresh dung is laid on, yet the onions, and the other plants recommended by the author, are not less exhausting to the land.

4. The third year he sows carrots, parsneps, radishes, and gourds.

Remark. All these plants require a great deal of nourishment, and extract it from some depth, like cabbages, so that the arguments used by the English writers fall to the ground.

5. The fourth year, bastard saffron, poppies, and kidney beans.

Remark. These plants, at least the two last, require a good soil.

6. The fifth year, turneps, rape, carrots, and beets.

Remark. What! after the land has borne plants, which require so much nourishment, does he plant them again? We must then conclude, that during the course of the fourth year, the salts adapted to their growth were collected anew.

7. The sixth year bastard saffron, poppies, and millet.

Remark. Millet is said to impoverish land more than any other kind of grain.

8. The

8. The seventh year winter rye, which if it does not require the best of soils, at least is not contented with one so indifferent as some other sorts of grain.

9. The eighth year winter rye again.

Remark. In this part of the world it is generally thought that the same grain should never be sown two successive years. It must be admitted, that our author requires that the land should be plowed immediately after harvest; that it remain in this state till the end of October, or longer, if the season permits; that it should then be plowed again and sown.

10. The ninth year barley, wheat, and summer or spring rye.

Remark. All these grains, particularly barley, require a good soil.

11. The tenth year the field must be plowed very deep, and may then be sown with carrots and parsneps.

Remark. Could we have the least hope that such roots would thrive in this land, which should seem to be entirely impoverished in the preceding nine years, if by a deep plowing it was not supplied with the salts adapted to the growth of these plants, not with any manure?

12. In the eleventh year poppies, bastard saffron, fenugreek, cumin, coriander, anise, &c.

13. The twelfth year winter rye.

14. The thirteenth, barley, spring rye, and summer wheat.

15. The fourteenth year millet, fenugreek, cumin, peas, kidney beans, broad beans, french beans, lentils, &c.

16. The fifteenth year barley.

17. The sixteenth anise, carrots, vetches, and coriander.

18. The seventeenth year oats, or if you will poppies, and then

19. In

19. In the eighteenth year oats.

Remark. Many of the crops we have above particularized occur in the account of the succeeding years.

This author gives also some other courses of crops. The sample I have already given will answer my present purpose, I must refer those who are willing to know more of the matter to the work itself.

He carries his system four years farther; he would have us reap the fruits of our land twenty-two years, without any fresh manure being applied, and without interruption.

Let us add one more remark on this subject. Arguments however good, and founded on sound reason, they may be, are liable to be contradicted by other arguments, which often bear the appearance of truth. This is not the case with facts and experiments, if we would not appear absolutely incredulous, we must submit to their force.

Mr. Reichard caused his work to be printed at Erford, immediately under the eyes of his countrymen. He refers to their testimony, and nobody has as yet contradicted him. It is therefore proved, that all these facts are incontestably true. The consequences therefore to be deduced from them in favour of this system cannot be less so.

I should, however, imagine I had treated this important subject much too slightly, if I passed over the arguments advanced by the the English authors, and defended by the celebrated du Hamel, in favour of the contrary system.

Nothing can be more extraordinary then the answer which the English make to the observation, that the flesh, the shell, and the kernel of the peach must necessarily be composed of different juices.

They say that the earth which furnishes these juices, has no resemblance to the parts of this fruit. Was there ever such a solution before made? Can a
coarse

coarse earth mixed with a thousand heterogeneous parts, have the same taste, or the same properties, as the infinitely dilated particles which have been extracted from it? It would be very easy to retort the argument, by saying, that the earth has not the taste of the fruits; that it is neither sweet, bitter, acid, oily, or salt, therefore the fruits extract no nourishment from it.

The flesh of the peach is sweet, the kernel is bitter and oily, the shell is a woody substance. If all these proceed from the same juices, we may as well say that a house of clay, stubble, brickwork, timber, freestone, sandstone, or marble, in a word, that the windows and spring water are all of the same substance, because they are all parts of the same house, and are all extracted from the earth. Why may not we also say, that painters colours are all the same, and made from the same drug. Hitherto I have imagined that the parts required to form a woody substance, a solid or oily substance, and a watery or liquid substance, were different; but in the opinion of these writers, I have been in an error.

They also say, that corn does not put forth deep roots, and that for this reason it thrives very well after clover and lucerne, but that these last do not succeed after Saintfoin, which sends its roots deep into the land.

In this there are several errors. 1. It is true, that we do not distinguish any tap root, or other deep roots in corn; but are we certain, that the several sorts of grain do not send their roots deep into the land when the soil is well prepared and adapted to their nature; many proofs of the contrary might be brought. Besides, why do farmers in some places plow so deep a furrow, even frequently to the depth of a foot or more? Does not the farmer imagine when he takes this trouble, that the roots can draw nourishment from that depth; and does not experience convince

convince us, that in strong lands deeply plowed, the corn is less subject to lodge, and is more vigorous?

Fortunately they do not assert, that corn will thrive well after saintfoin. This would be in contradiction to all experience, though that plant sends forth very deep roots. But they do not assign any reason for this, which is, however, very simple, being the same why lucerne and clover do not succeed after saintfoin. Saintfoin thrives in the most barren, sandy, gravelly, and dry lands; but the two first, like all sorts of wheat, require on the contrary a good soil.

The author of this essay addresses his objections to Mr. Du Hamel, as being the great partizan of the English system, on the effects of the form or organization of plants. If there is any doubt of Mr. Du Hamel's meaning to attribute the various effects of vegetation to this organization alone, without the concurrence of any difference in the juices; it is at least the sense which his words seem to import. It is therefore only on this first supposition, that we address to him these objections, which are meant to prove how little satisfactory such a system is.

Let us now see what objections M. Du Hamel proposes. "It cannot be doubted, says he, but that the earthy particles which plants imbibe, assume different forms in every plant, but it does not thence follow that the nutritive juices are not the same whilst in the earth."

It should seem then that Mr. Du Hamel looks upon the form and organization of the parts alone, and not the matter, the nature of the food, the juices, as the cause, which makes a peach have a downy skin, a delicious watery melting and sweet flesh, a shell harder than wood, a kernel softer, yet firm, sweet or bitter and oily, and this wonderful organization must be contained in the space betwixt the end of the branch and the fruit, because in the
end

end of the branch and fruit, because in the end of the branch nothing of this kind appears; whereas I always apprehended, that the several juices being got thus far, were distributed according to the rules established in nature, by the sovereign Creator, to form the various parts entirely and absolutely dissimilar.

Firs for instance may have the same organization throughout; their wood is porous and spongy; if they only required a great deal of nourishment without any regard to its nature, what tree ought better to succeed in wet or even marshy soils than this, yet in such soils the wood is absolutely unfit for use? It is well known that if the roots penetrate to any water or even to a soil too moist, the trees begin to rot at bottom, before they have attained a third of their natural growth. Such as grow in soils that are rather dry than moist thrive very well, but it is certain that their wood is more spongy, and does not last so long as that which grew in a dry stony or gravelly soil. The reason is self evident. The juices and salts to which water serves as a vehicle do not agree with the nature of the juice. It requires others which can form a resin.

This fact also proves that plants which require a great deal of nourishment, imbibe all they meet with, for want of that which is better adapted to their nature; but as every kind of food is not equally adapted to their nature, it is evident that if they find what is proper for them, they will, after the manner of animals, reject the others.

This author relates an experiment extracted from the memoirs of the Academy of Sciences. That a young lemon of the size of a pea being grafted by the stalk on the branch of an orange tree, increased in size ripened and preserved its quality of a lemon without participating in any thing of the orange-tree. "It is therefore necessary, says he, in

this experiment that the juices of the orange-tree should suddenly change their nature in passing into the lemon."

It is evident I relate this passage impartially; but I will do still more, namely, add some other instances to strengthen this argument.

A short time since, a friend of mine, a man of note, shewed me at his large and elegant villa, a wilding apple-tree, on which were grafted several scions of a superior kind, amongst the rest there happened to be one of a pear-tree, which succeeded as well as any of them.

I will next mention something still more striking.

M. Tschiffeli, (that worthy patriot, institutor of our oeconomical society) has attempted to graft several sorts of scions without choice, on the roots of various trees without distinction. Almost all these scions succeeded; whence some conclude that my system is entirely overset.

Let us now examine whether it is even at all affected.

The two first experiments of the lemon on the orange-tree, and the pear on the apple-tree, are too much alike to be separated. Let us consult Linnæus and his system with regard to plants. In the Edition 1752, he has 1090 genuses, and in every genus from 1 to 30 or 40 species. Without attending to subdivisions, all the pears are of one species, as well as all the apples, plumbs, peaches, cherries, lemons, citrons, oranges. Farther, apples, pears, and quinces, are three several species of fruit of the same genus; lemons, citrons, and oranges the same, as also plumbs, apricots, and cherries, peaches, and almonds.

According to our system the greatest difference of juices should be amongst the 1090 genuses; they will be much less amongst the species, and there will

will be but very little amongst the varieties of the same species; I mean that there would be a great deal of difference betwixt those of a walnut-tree and a peach-tree, much less betwixt those of an orange-tree, and a lemon-tree, and a very little betwixt the several kinds of these fruits. Consequently why should we be astonished that a lemon succeeded on an orange-tree, a tree of the same genus, or the scion of a pear-tree, on an apple-tree?

Gardeners and Husbandmen, nay all who are not grossly ignorant in this matter, well know, that scions of kernel fruit-trees, are grafted on kernel fruit-trees; pears and apples on quinces, and those of stone fruit-trees, as peaches, on plumbs and almond-trees; with this management they will take; but I never saw a scion of an apple-tree succeed on a cherry-tree, nor that of a peach-tree on a quince. By drawing the conclusion in the manner of M. Du Hamel, we may say that he who proves too much proves nothing at all. All sorts of scions grafted on any tree should succeed, but this is contrary to experience.

It may perhaps be said, that I attend not to my subject, that the experiment of M. Tschiffeli, proves it to be a truth that all sorts of scions equally well succeed on all sorts of trees. But this is a mistake, it is only on the roots which is totally different.

It should seem that the roots of trees greedily imbibe more or less all kinds of juices. From the roots these juices pass into the bark, thence into the wood of the trunk, afterwards into the branches and their bark; lastly into the buds, leaves, flowers, fruit, &c. Now let any one judge, by the difference of these juices and their flavour, in the fruit, and in the roots, how much they have been purified, changed, and as we may say, refined in their passage, and by the circulation, before they arrive at their destination.

Let any one chew some wood, some bark, some of the leaves which grow so near the fruit, and lastly some fruit, and then declare whether there is not an infinite difference. The order of nature conveys to every part the juices best adapted to the end for which God created them.

Let any one reflect on the sweetness of the kernel of a walnut, and on the insupportable bitterness of the rind or bark of the shell, which all animals and even insects nauseate. It surrounds the nut, of course it is very near it, and the whole nut, as well the kernel as the rind, is suspended on the same stalk; thus is the difference much more surprising, than that of a lemon, and an orange, growing on an orange-tree. Did the same juices nourish both one and the other? Can this great difference be owing to the organization and structure of the nut, or are these organs placed at the end of the branch? finally what part could have effected such a difference. Let us reason a little on this head.

We have observed that matter is real, form accidental; what is accidental, may be, or may not be, but matter will always be substantial let its form be what it may. Wood is still wood, though it may be square, round, hexagonal, octogonal, or of any other form; and should any say that wood is only wood because it is square, without which quality it would be stone, he might with great reason be laughed at; how then can form which is accidental, have any influence on matter which is substantial? Let it not be said that the form in salts, acids, and oils, occasions their qualities. I will only partially, not wholly, admit this; if the particles of the various kinds of salts are the same, and give them the same qualities as salts, yet are their effects amazingly various.

But

But let us advance a step farther. It must be admitted that matter must necessarily exist before form, since matter can successively assume various forms. I will then suppose that the form, the organization, may somewhat contribute to the difference of juices, and flavours in a fruit. From whence proceeds the origin of this organization, this form, what is the cause of it? We must have recourse to the matter; without the matter or substance no form could subsist, of course it cannot be denied, but that the substance, the matter, the salts, and the divers juices constitute the primitive cause, and this cause subsists throughout, though the organization may in some sort be assistant to the effects, because the substance remains to the end of nature's operation.

But to return more immediately to the subject in hand; I have supposed 1090 genuses of plants, which for the most part require a particular food. In every genus, taking one with another there are twenty species. The species, for instance, will require fifteen-twentieths of the same food, as orange trees and lemon-trees; some will require eighteen-twentieths or nineteen-twentieths more or less; and these fifteen to ten-twentieths shall be varied by compositions and mixtures more artfully made than those of chemists. We must not then be surprized, if a branch or a fruit requiring only one-twentieth or two-twentieths should find wherewithal to support itself, amongst the quantity and different qualities of the juices, dispersed in the wood, the branches, and the leaves of a tree, and of a kind which others do not want, thus is there nothing to be wondered at in the success of the lemon and the pear-tree scion.

The same may be said of the grafts on the roots. If I had had any opportunity of observing what grafts succeeded and on what kinds of roots, I might perhaps have been able to have deduced some arguments from
the

the experiment, and made observations on the subjects more exact than I now can; this not being in my power I will suppose they succeeded on all kinds of roots, and even this will not prove against me.

We have already observed that the roots imbibe in a manner all the juices they meet with, and that the separation, the coction, the refining, and straining the juices, are only done successively and by slow degrees. If then a scion is grafted in the root, it is near the reservoir of all the different juices, and may chuse which ever is best adapted to it's nature, rejecting the others. These roots serve as organs, mouths, and channels to convey to it the nourishment it may require. This is proved by well known experience, for in grafting on the trunk, at a certain height, or on the branches, such an association never succeeds. If we endeavour to graft a peach on a walnut though they are both kernel fruits, or a pear on a cherry-tree they never succeed. And what is the reason of it? Because at this height the tree by purifying the juices, has left behind the greatest part of those which are not adapted to it's nature. I therefore conclude that this experiment is rather in favour of my system than against it.

We form to ourselves gross ideas from the evidence of our senses and our false conceptions of things. As soon as we have adopted an idea, we imagine we have discovered the depths of nature, and explain the causes of effects by what we smell, feel, and see. Chemical experiments are the *ne plus ultra*. We imagine that by analysing some substances by chemistry we discover the elements and true principles of plants. This science has indeed been the means of making surprizing discoveries, yet have we by the help of it discovered only the grossest of these elements, which must themselves be composed of an infinity of others, invisible, impal-

impalpable, and which escape the notice of our senses.

We must not conclude, because we have not been able to discover these juices by the help of chemistry, or by other experiments, that they do not exist. How many real and incontestable facts are there, of which the true causes are not known, but conjectures and guesses are substituted for them.

The answer Mr. Du Hamel makes to the second allegation, appears to me to be very weak. "We do not, says he, discover in the earth any flavour of the fruit, of course the juices of the earth are not the cause of it." I see nothing of those fine brocades in the worm that spins the silk. I do not perceive this flavour, this taste in raw meat, therefore the ragout is not made of it. I do not see that admirable painting in the colours, either ground or unground, nor in the brush, therefore it is not to them that the picture is indebted for its lustre.

The answer to the third allegation is not more coercive. It is only necessary to read it, to perceive that I am of his opinion, namely, that plants, when they have no choice, indiscriminately imbibe all juices, even such as are detrimental to them; but then they soon decay.

The answer made by Mr. du Hamel to the fourth allegation, has already been discussed. It will suffice to say one word with respect to the reason he alledges, why rushes, thistles, or blue bottles, should not, according to our system, kill wheat, as those plants only imbibe such juices as are not adapted to the wheat.

Who informed this writer that they imbibe none of these juices? It is very probable, that according to my imaginary calculation, they have occasion for fifteen-twentieths of the same juices, and the wheat also of course requires fifteen-twentieths, so that there will be a deficiency of ten-twentieths on the whole,

whole, some of these plants therefore must languish and die. Wheat is cultivated, and weeds growing naturally, and being of a voracious nature, the last get the upper hand and destroy the first.

Some have endeavoured to prove by chemistry, that plants only transpire a pure phlegm. Besides what we have already said, relative to the insufficiency of chemical experiments, this confirms the allegation, "that every plant only appropriates to itself the parts necessary for its nourishment, and that the others pass off by transpiration." This writer, doubtless means, that the plant, having by means of its root, imbibed all kinds of salts and juices, and only reserving what is adapted to its use, the others must of necessity be found on distillation, and in this he is mistaken.

To return to the analogy there is between plants and animals, if man made a good use of his will, he would not hasten his death, and frequently pass the better half of his life in acute pain, which he has brought on himself by intemperance; he would reject unwholesome food, and content himself with that which would contribute to prolong his life, and make him pass it free from disease. Beasts, guided by instinct, take only such as is suited to their nature, unless they are compelled by necessity to do otherwise; it is the same with respect to plants, to which the order which God has established in nature, supplies the place of instinct. They never imbibe juices which are not adapted to their nature, unless they are compelled to do it, so that they have no occasion to dissipate them. If they are obliged to receive an uncommon food, these juices, though hurtful, must be converted into nourishment, the same as in men and beasts, and being by their concoction become more gross and substantial, they cannot be dissipated in the air.

One

One thing more is to be remarked. A great part of the food which men receive escapes by means of various secretions; but that which is converted into blood, is dissipated by transpiration, in order to it's being succeeded by the after-taken nourishment.

It is the same with respect to plants. The roots attract and imbibe the grosser juices of almost every kind, and begin to discharge themselves of some to form the wood, rejecting that which is absolutely contrary to their nature; the juice that is somewhat purified enters into the bark, whence, one part like the blood, passes farther through the bark and the wood, into the branches; being still more and more subtilized and purified, the juices pass, as nature directs, into the leaves, the flowers, and the fruits; which at length contain only that which is most suitable, select and exquisite, being the quintessence of all those juices which were originally so gross. This may be compared to the chyle, which is converted into blood; this last, with regard to the internal preservation of the parts of the body, serves only to produce a liquid still more delicate, soft, and balsamic, which enters into the flesh, the nerves, and in fact, into every part that requires to be supported by a kind of nourishment constantly renewed. It should seem to me, that this analogy renders the system I defend, more probable than any other.

I ought on this occasion, to mention a nourishment still more subtile belonging to plants, but it would perhaps take up too much time.

Mr. du Hamel will have it, that plants transpire, and that the particles which exhale by perspiration, float in the air, and that being borne away by the winds they cannot again fall to the earth, whence they were extracted.

I admit of all this, what conclusion can be formed from it against my system? This transpiration, mingling itself with other particles in the air, turns to clouds, dew, rain and snow, falling sometimes on one soil, sometimes on another, giving a general fertility to the earth, as experience may convince us; thus his observation falls to the ground.

We may still add, that plants do not solely subsist on the juices extracted from the earth, by the channels and veins of the roots, the wood, and the bark, but also by the leaves. Authors have already acknowledged that they were necessary for transpiration, and to evaporate what was superfluous, in the same manner as the pores of the skin in men; but in my opinion, they besides this, serve for aspiration, extracting a very subtile nourishment from the air. Many observations confirm me in this opinion.

One of my particular friends, fond of every branch of husbandry from his youth, seeing in the garden of a relation, an apple-tree loaded with fine fruit, and knowing that the leaves of vines were pulled off, in order to make grapes ripen the better, he thought to bring these apples to a perfect maturity, by rendering them the same service. The instant the leaves were pulled off, the circulation of the sap entirely ceased; and the following spring he was still more mortified, to see so fine a tree irrecoverably dead.

I have indeed, myself observed in vines, that the more leaves are pulled off, the less the grapes ripen; for though they become yellower than the others, they are not so juicy, nor of so fine a flavour. It cannot be said that the transpiration was stopped in the apple-tree, as this might have been continued through the bark and the end of the stalks whence the leaves were taken; and even if it had been stopped

stopped, the effect would have been quite contrary to what it was, for the fruit would have been large, but less delicate in its flavour, because the sap would not have been purified by transpiration.

What confirms me still more in the opinion of transpiration, is the dew, and its wonderful effects. It is well known not to penetrate the earth, at least not so far as the roots of plants, to what cause then must we ascribe the admirable service it is of to all plants? It attaches itself only to the leaves and flowers, or at most to the bark: the effects we see result from dew, can never proceed from its cooling quality only; it is of much greater service than rain, and this last, than common water; though if in times of great drought, when even dew does not fall, entire trees, particularly the leaves, are refreshed in a morning with common water, by means of an engine, the effect will be surprizing.

The honey-dew, on the contrary, does infinite damage to trees, because it stops the pores of the leaves, and prevents both transpiration and aspiration; the tree then resembles a man, who is within full of humours, and whose perspiration is stopped.

I am therefore of opinion, that all plants receive the most subtile part of their nourishment from this aspiration; the dew attaches itself to plants, by imperceptable and slow degrees, and it is necessary there should be a matter as subtile as dew, to serve as a vehicle to particles still more subtile. It undergoes a thousand and a thousand evaporations amongst plants, and every one extracts from it, that which is best adapted to its nature; but that these particles may have their natural effects, the juices extracted from the earth, which make perhaps ninety, or ninety-nine one-hundredths of the whole, must have done their part; for if this is not the case, these imperceptable particles cannot act

on the others, which are infinitely groffer and more material.

We may pass over the answer to the sixth allegation. Mr. du Hamel, in his answer, attributes the cause why wheat does not succeed two years together on the same land, to the number of plowings being lessened; this is not of consequence enough to detain us a moment, as the principles we have laid down, explain it in a very simple way.

I shall now conclude, hoping that though my system may not be allowed as absolutely certain, that yet it will be acknowledged as founded on probability, at least; and if this system has any foundation in truth, it merits a strict examination, and that experiments should be made, as the many parts of it are very difficult to be accounted for. With this view only, it is that I have consented to publish my ideas, not being desirous of excelling, or of teaching others, who may have much more knowledge in these matters, than I pretend myself to have.

ARTICLE

ARTICLE XXXVI.

An Essay on the Naturalization of Foreign Trees and Plants in Switzerland; written by Mr. de GRAFFENRIED, Lord of Worb.

IT cannot be denied, but that our country would receive considerable benefit, from the establishment of good kinds of foreign trees and plants. I will then endeavour to demonstrate the possibility, and the manner of executing it with success.

The writings of ancient authors who have treated on the subject of agriculture, sufficiently prove the possibility of making trees brought from hot countries, thrive in cold climates. Cato, Varro, Columella, Virgil, Palladius, and Pliny, assert, that the much greater part of their best kinds of fruit, was in their time, brought from the eastern countries into Italy, from whence they afterwards spread into the coldest countries of Europe.

Lucullus, brought cherries to Rome, from Cerasonta, a town of Pontus, about 78 years before the birth of Christ. Above 100 years afterwards, apricots were carried thither from Armenia, and plumbs from Syria.

Peaches were not known in Rome, till about thirty years before the time of Pliny the Naturalist, and took their Latin name *Perfica*, from Persia, from whence they were first brought. The best kinds of pears came from Syria and Egypt; quinces from Crete; chesnuts, wallnuts, and filberts, from Asia Minor; the service-tree was not known in Italy,

Italy, till the time of Cato the Elder; snow-balls, Indian chesnut-trees, and Jessmine, all come from hot countries, and yet succeed very well in all parts of Europe.

Modern writers, agree in this matter with the ancients.

Witson, after a thousand trials had failed, established in Europe the coffee-tree, and that king of fruits, the superb ananas. These two plants, though brought from the hottest climates, have nevertheless succeeded in our cold climate, by the help of industry and artificial heat, so as to bear fruit.

Ginseng, that precious medicinal plant, which came originally from China, is cultivated with success in Canada, from whence it is exported even to China itself.

Rhubarb, which was at first brought from the East Indies, has been found in considerable quantities by professor Gmelin, and the botanists of Peterbourg, in Siberia, and Russian Tartary, and at present makes a capital article in the Russian commerce.

In many gardens in Sweden, Russia, Norway, and Denmark, are to be seen the finest peaches and apricots: I saw myself in a valley of the canton of Berne, called Grindelwald, enriched with mountains continually covered with snow, and within a cannon shot of the Gletscher, a garden in which the peaches and apricots were perfectly ripe, as well as most other kinds of garden crops: the Italian honey-suckle blows there all the summer and autumn.

Mr. Tournefort, found on Mount Ararat, in Armenia, plants which grow wild in the northern parts of Europe, as well as in Italy and France. the same traveller, in his voyage to the Levant, found the ever-green oak, (which is only commonly met with in Spain, the southern provinces of France, and

and in Italy), growing in the isle of Candia, at the foot of mountains continually covered with snow.

Mr. de Haller, that celebrated botanist, that ornament to our country, has also discovered in his numerous and dangerous excursions, on the highest mountains in Switzerland, herbs and plants which botanists had till that time, only remarked on the tops of the Italian mountains.

The new discoveries of a Kalm in North America, Koempfer in Japan and Asia, Haselquist in Palestine and Egypt, Osbek in China, Linnæus in his voyage to the island of Schonen, and in his *Flora Lapponica*, sufficiently demonstrate the principle I set out upon: and the examples of diverse other countries might be alledged in proof of it.

Let us turn our eyes towards the prodigious changes which have happened in Germany. That beautiful and fertile part of Europe, was in the time of Tacitus filled with horrid desarts, and the inhabitants were obliged for want of better food, to eat bitter acorns; and in our times, by means of a laborious industry, it is the most pleasant, the mildest, and the most fertile country in Europe. Instead of thick forests and unwholsome bogs, we now find there, the most fruitful corn lands, the richest pastures, with plenty of wine and excellent fruit.

Let us next survey England. What immense advantages have the wise inhabitants of that fortunate island, derived from the improvement of every branch of agriculture? It is well known that they are indebted to this happy change, for their riches and their power. Cast your eyes on the country houses and villas of the English; of a duke of Argyll, a duke of Richmond, of the late lord Peters, a Collinson, and on the botanical garden of Sir Hans Sloane at Chelsea, are they not palaces of nature;

nature, where art, utility, and all the beauties of the creation, present themselves to your view? Has not the great attention bestowed on agriculture, immortalized their illustrious writers? Read the works of Miller, Lawrence, Mortimer, Evelin, Ellis, Bradley, &c. can we bestow admiration enough on these men? they never had their equals in any other country.

Sweden, upon the instances of the immortal count de Tessin, and the celebrated Linnæus, sends at the public expence, professor Kalm into England, and some parts of North America, to search for foreign trees and plants, and collect œconomical observations for the benefit of the kingdom.

The wise king of Denmark, a monarch superior to all praise, sends for the same purpose, three learned men into Arabia Fœlix, and other eastern countries, which will enrich the kingdom with foreign plants, and natural history with new discoveries.

France is not at this time, less attentive to the well being and prosperity of agriculture, that inexhaustible source of power and wealth. The royal œconomical society lately established, the society of Britany, the writings and experiments of the celebrated Buffon, du Hamel, de Mirabeau, and de Turbilli; the gardens and improvements of Trianon, the duke d'Ayen, the Abbé Nollins, Bombarde, and Aubenton, are sufficient evidences of the high esteem the French have for agriculture, and that it not only finds employment for some of the greatest men in the nation, but also contributes to their pleasure.

I conceive I have fully demonstrated by what I have already said, that it is by no means difficult to make those foreign trees thrive in our country, which are brought from hotter climates, but where the cold is nevertheless sometimes severer than it is
in

in Switzerland, as in Virginia, Pensylvania, Canada, Carolina, Chili, the Cordillieros of Peru, &c. As this is the case, why should we not, when we shall thereby increase the products of our country, endeavour to improve, embellish, and soften by art and care, assisted by nature, the rudeness of our soils.

It may possibly be objected, that the cold which predominates in the greatest part of Switzerland, will render my scheme abortive. But let such reflect on the great and agreeable change that has happened in Switzerland, with regard to all kinds of fruits.

Forty years ago very little fruit was to be seen, and that very bad, whereas we have now the satisfaction of seeing our tables covered the year round with the most delicious kinds. We have cherries from the beginning of May to November, peaches from June to November, and the most exquisite apples and pears the whole year. If I am asked what sorts of useful trees and plants we still want, when we have already so many; instead of giving a direct answer, I will make out a list of several sorts of trees, and in my turn, ask whether they would not be of great utility in our country.

For instance, 1. The White Virginian Oak, bearing sweet fruit, and good to eat. 2. The Red Virginian Oak. 3. The Cedar of Libanus. 4. The Virginian Cedars. 5. The Armenian Pines. 6. The Sweet Maple of Carolina. 7. The Styrax, or Liquidambar of Virginia. 8. The Sassafras Tree. 9. The Saffaparilla. 10. The Ceonothus. 11. The Lobelia (or Cardinal Flower) with blue blossoms. 12. The true Rhubarb. 13. The Lentil-bearing tree of Siberia, called Aspalathus. 14. The Evergreen Oak.

No. 4.

O o

Would

Would not our gardens and villas be more embellished, if instead of the Indian chefnut-tree, the fir, the yew-tree, favine and juniper, they were adorned with, 15. The fine Indian Lawrel. 16. The Virginian Tulip tree. 17. The American Tulip tree, with Lawrel leaves. 18. Bignonia. 19. Cedars. 20. The Cherry Lawrel of Portugal. 21. The Arbutus, or Strawberry tree. 22. The Judas tree, with red and white flowers. 23. The Azalea. 24. The Benjamin tree. 25. The Pisshamin. 26. The Liane and Clematite. 27. Pavia. 28. The spotted leaved Oak. 29. The Chefnut tree, with leaves spotted with gold or silver. 30. Piracantha. 31. Bastard Ebony. 32. Coluthea. 33. The several kinds of foreign Roses. 34. Ketmia. 35. Bastard Senna. 36. Althea. 37. Grewia. 38. Jupiter's Beard, &c.

After having proved in a clear and evident manner, the possibility and utility of naturalizing foreign plants, I should, in order to accomplish the task I have imposed on myself, lay down rules which are absolutely necessary to be observed in these experiments, and at the conclusion of my essay, I shall give a list of the different kinds of foreign trees and plants, which have for a considerable space of time resisted the greatest cold of our climate.

First rule. It will be proper to chuse for these experiments the strongest and largest plants, since it is very evident, that well rooted plants will be better able to resist the extremity of the cold, than those which are more tender and delicate.

Second rule. During the first and second years, the plants, according to the nature of the seed, should grow in clusters, and care should be taken to put them in a green-house in winter, where the degree of heat should be kept up to the last degree of a botanical thermometer, that the time of their first shooting, the duration of their growth, and the qualities

qualities of their wood and buds may be well observed. To the last in particular, great attention should be had, for in the structure of the buds, subsist the principal reasons, why trees which have grown under the equinoctial line, seldom thrive in cold countries, having naturally but few buds, and a very thin sheath, or spatha.

Third rule. Trees or plants which are brought from a temperate climate, should always be planted in the spring, that they may take firm root before the winter comes on, and accustom themselves by degrees to the cold of our climate; and though the severity of the winter may injure the plants, there will still be room for hope that they will make new shoots from the roots, in the succeeding spring or summer.

Fourth rule. It will be necessary to get information, in what soil these plants originally grew; whether it was in a moist or dry soil, a clay or a sand, and whether the plant originally grew exposed to the sun, or in the shade.

Such as neglect these precautions, will lose both their time and money, and will, to their great regret, make a thousand fruitless experiments. This is evident from the many experiments that have been made to introduce the *Alpine Roses*. If they are not planted in a soil and situation proper and agreeable to them, not one in an hundred will succeed.

As most of the North American plants grow in a clayey soil, mixed with sand, it will prove very easy to imitate such a soil in this country; but I have remarked, that none of these artificial mixtures of earth are of any real use, for on the contrary, they make the plants sickly and suddenly kill them.

For my particular part, I have found that virgin earth, taken from beneath the turf of a good pasture,

ture, is best adapted to most plants: we find in the Treatises on the Art of Gardening, as well in German as in French, a number of mixtures of earth, dung, and sand, but I think them very hurtful, or at least of little use.

Fifth rule. Such trees and plants as shoot early, should be planted in places where they may be sheltered from the heat of the sun in the spring, in order to retard their shooting, and preserve them from the spring frosts.

Sixth rule. Such trees and plants as shoot late, should be planted in places exposed to the heat of the spring sun, that their young tender shoots may have time to grow strong before the winter, as less danger will then be apprehended from the effects of the cold.

It is necessary to observe in general, that all foreign trees thrive better and live longer in our country, when in an eastern and western (provided they are sheltered from the north easterly winds) than in a southern aspect which exposes them more to the spring frosts, so hurtful to plants. The celebrated Miller says, that the fig-tree in a northern aspect, is in less danger of being frozen, than when it is planted in a hotter situation.

I must also farther remark, that the roots of almost all the plants herein-after-named, were covered the first year, to the depth of four inches, with rotten tanner's bark, and the plants with dry leaves, and wrapped in pea or other straw. The second year, the dry leaves were taken away, the third year the straw, and the fourth the tanner's bark. We must also particularly observe, that every day when the weather is mild, the covered plants should have a certain quantity of air given to them. I was obliged in 1759, having omitted this precaution, to cut off close to the root, a Virginian tulip tree

tree fifteen feet high, which was stifled for want of air.

Not having any intention of mentioning in this Essay any foreign plant, except such as have sustained for four years in the open ground the cold of our country, the list I shall produce will not be very considerable, but I flatter myself it will speedily be encreased, as I have reason to hope my plantation will soon be much augmented. Not long since Messrs. de Ponthieu, two rich English merchants, who are themselves great lovers of agriculture, generously encreased my stock with above 200 American trees and plants, amongst which are many that no botanist has yet described.

A List of several Foreign Trees and Plants, which have been four Years growing at Worb.

1. *The Cedar of Libanus*, is a fine tree, very lofty, and ever green, the utility and beauty of its wood, may sufficiently be known from the Holy Scriptures.

2. *The Tree of Life* from China, is also a fine ever green tree, but it is as yet too scarce for its utility to be known. The French missionaries brought it from China to France a few years ago.

3. *The Tulip tree, or flowering Maple* from Virginia, with curled leaves; it grows to a prodigious size; the beauty of its flowers and leaves, occasion it to be ranked amongst the most elegant of known trees; the wood of it is much esteemed in Virginia, on account of its utility.

4. *The Maple of Canada*, differs somewhat from ours, and is as profitable.

5. *The flowering Ash tree*, is much esteemed on account of its flowers, and because the flies and other insects do not destroy its leaves, as they do those of the common ash.

6. *The*

6. *The Virginian Oak*, should in preference be planted on account of its fruit, which has the same taste as nuts; but its wood is much inferior to that of our oaks.

7. *The white Walnut-tree*, from Virginia: its fruit is exquisite, and its wood very fine.

8. *The black Walnut-tree*, its fruit is black and bad, but its wood is very beautiful.

9. *The Eastern Plane-tree* grows to a prodigious height and size. The Romans and Greeks valued it much, on account of its shade, its size, and its duration.

10. *The foreign Maple* of Virginia, does not much differ from ours; its wood in Virginia, is used for all sorts of wheelwrights work.

11. *The Service tree* is very beautiful, its fruit as well as the medlar, may be eaten. It is planted in several parts of Switzerland, but I do not believe it grows in this country without culture.

12. *The wild Olive tree*, has silver coloured leaves, and its flowers have a fine smell.

13. *The small Chesnut tree* with red flowers, is very beautiful whilst it is in blossom.

14. *The Cornilberry tree of Virginia*, has branches of the colour of coral; its trunk is also red; it blossoms from spring till winter.

15. *The Saint Lucie Wood* bears pretty flowers. The turners value its wood on account of its beauty.

16. *The Judas tree*, with red flowers.

17. The same, with white flowers. They are both very beautiful.

18. *The Tea tree of Peru, or Carolina*. The inhabitants of those countries, make use of its leaves for tea. The flower is very elegant.

19. *The Cherry Lawrel of Portugal*, is a fine evergreen.

20. *The*

20. *The Sumach.*

21. *The Jasminoides, or Bastard Jasmine of China,* its utility is not yet known.

22. *Bastard Indigo,* is a very pretty shrub.

23. *The Emerus, or Bastard Senna,* the same may be said of this plant.

24. *Several sorts of Ketmia,* are very beautiful.

25. *The Althea,* is also elegant.

26. *The Virginian Jasmine,* is very beautiful.

27. *The Piracantha,* a kind of Medlar, is a very fine shrub.

28. *The small Medlar tree of Virginia,* and other kinds, are very beautiful, and make fine sweetmeats.

29. *The Evergreen Oaks* are very beautiful, they bear seed in Languedoc.

30. *The Lote tree, or wild Service tree.* The flower is pretty, and the fruit good to eat.

31. *The Myrtle, or Wax tree of Carolina,* its fruit yields a fine green wax.

32. *The Virginian Strawberry, with scarlet Blossoms,* the fruit has a delicate flavour.

33. *The Armenian scarlet Strawberry,* is still more delicious.

34. *Drayton's Ananas, or the green Strawberry,* excels them all.

A List of several Plants which were killed in 1761, by the severity of the winter, not having been covered.

35. *The Chili Strawberry.*

36. *The Blue Passion Flower, or Granadilla.*

37. *A Species of Virginian Cedar.*

38. *The Melianthus.*

39. *The Hamamelis.*

40. *The Hydrangea.*

41. *A Species of American Moss.*

42. *The Caper Tree.*

43. *The Cistus of Montpelier.*

ARTICLE



ARTICLE XXXVII.

Practical Directions for cultivating Flax, adapted to the Climate of Switzerland. Written by Mr. TSCHIFFELI.

Of the SEED.

IF good, well cleaned seed is not sown, we must not expect to have a fine crop of Flax. The characters of well conditioned Flax seed, are as follow.

It should be, 1. Of a bright shining brown colour.

2. It should not be flat, but thick and plump.

3. It should crackle much when cast on live coals.

4. It should sink to the bottom, almost as soon as it is thrown into the water.

5. In general, the best Flax seed is produced on strong lands, and in cold climates. Experience has long convinced us, that what is brought from Livonia, is to be preferred to all others; but when this cannot be procured, we must make use of that which grows on our mountains; for instance, on Gessenai, Hasliland, Siebenthal, Ementhal, Jura, Gros de Vaux, Lengenbergh, &c.

What land is best for Flax.

All land that is not too wet or too stony, and that has not too much sand or gravel mixed with it, may do for Flax. There are, however, some soils which may be preferred. The best is black earth,
neither

neither too strong nor too light, and after having mentioned this, we must observe, that strong land of what colour soever it may be, is to be preferred to light land.

Flax is sown either in grass grounds, or worn out pastures after they are broke up, or in plowed grounds, the first or second year after the year of fallow. Some even sow it in the year that should be fallow, but as this method is seldom attended with success, we shall say no more on the subject.

In what manner grass grounds and pastures are to be prepared for sowing Flax.

1. Such land must by the end of July at latest, be turned over in small furrows, either with a breast plough or the common plough, cutting about two inches deep; this will cause the turf to dry and rot.

2. As early in the month of September as may be, after the turf is dry, a heavy harrow must in dry weather be drawn over the field, in order to pulverize the land as much as possible.

3. The month following, if your land is not very rich, it must be dressed with very rotten dung, about ten loads will be sufficient for an acre. It must be regularly spread, and in dry weather it should be plowed in, to the depth of at least six inches. In this case the furrows should be as narrow as possible, and should remain open and unharrowed all the winter.

4. In the following spring, as soon as the ground is dry, it must be well harrowed, in order to pulverize the land, and break the clods if there should happen to be any.

5. About the middle of April, which is the season for sowing, the land must, in dry weather, be plowed a third time, somewhat deeper than it was the second plowing; and if, immediately after this

operation is over, the weather should not be favourable for sowing, the land must the same day be harrowed smooth.

In what manner land already in tillage, should be prepared, when Flax seed is to be sown the year after the fallow year.

In this case, the three plowings usually bestowed on the fallow, are to be given, observing only, that at every plowing the share goes a little deeper; that the dung should be covered in the third plowing, and that the land lay rough for the whole winter. In the spring it is to be managed in the manner above directed for pasture.

The manner in which land already in tillage should be prepared, when Flax seed is to be sown the second year after the fallow.

If the land has been well dunged the preceding year, and is beside of a good kind, there will be no occasion to manure it. But as soon as the crop of the preceding year is carried off, the land must immediately be plowed in small furrows, to the depth of about two inches, that the weeds may not impoverish it.

As soon as the weeds make their appearance, the land must be stirred with a pair of the largest harrows, and about Michaelmas, it must be plowed about six inches deep, in narrow furrows, letting it lay rough during the whole winter.

The spring following, as soon as the land is dry, it must again be harrowed, and afterwards laid level with smaller harrows, and when the season for sowing comes, it must be plowed for the last time.

It is necessary to observe in general, that Flax thrives best upon land that has the preceding year borne a crop which shaded the ground and prevented the weeds from growing; for this reason, there is seldom good Flax after a crop of rye.

Pre-

Precautions to be used in sowing Flax seed.

1. The quantity of seed to be used, should be proportioned to the nature and condition of the land, in the broad cast way, never less than two, nor more than three bushels to the acre.

2. Light lands should be sown earlier than strong lands, but always when the dread of white frosts is over, and never in rainy weather, when the ground is wet.

3. Be careful to pitch upon a mild day, when the wind is not in the north-east quarter, and when dew may be expected in the evening.

4. In such a mild day, begin if you can, to plow after noon; let the harrow follow close at the heel of the plough. A little before sun-set, as soon as you have some ground ready prepared, spread your seed; it is best to do it at three casts. Leave the work in this state till the next morning, when, without fail, the seed must be covered with a light harrow, or, what is still better, with strong rakes. This method of proceeding is of greater consequence than may in general be imagined.

5. If the soil is inclined to be light, or there is a probability of the spring being dry, immediately after the seed is harrowed in, let a roller be carefully passed over the land; or if the ground is not of considerable extent it may be closed by treading.

6. If the land was in want of manure, and that you had none proper for the purpose in autumn, you may now lay on some very rotten dung after the sowing, when the seed has been harrowed in, and afterwards pass the roller over it.

What manure is best adapted to the nature of the Flax.

As every kind of weed is prejudicial to Flax, and as, if there are many weeds, it will cost a great deal to clean the crop, it is much better to lay on

no dung at all, than to apply such as is not well rotted, and at the least a year old. If I had no good dung, I would rather chuse immediately after the seed was in the ground, to spread foot or ashes in a sufficient quantity, and roll the land the better to incorporate the manure with the soil. If I could not even procure this manure, it would be proper when the plants were about an inch in height, and in rainy weather, to sprinkle over them in the evening, hog's urine, cow's urine, or any other such matter, that was not of too hot a nature. The farmer may rest assured, that this last-mentioned manure, will have at least as good an effect as foot or ashes, and will produce very few weeds.

In what manner, and when Flax should be weeded.

1. The Flax being grown to the height of about four inches, may be weeded without any fear of damaging it.

2. This work should be carefully executed, but with as much expedition as possible.

3. The weeders should always go bare-footed into the field, and should work as much as possible sitting or lying down.

4. Every time they leave off working, they should heap the weeds and carry them away.

5. It is to be observed, that at this season the wind generally blows from one point; now they should begin to weed at the opposite part of the field, that is to say, the weeders should always face the wind, by this management the flax will rise the sooner.

6. This work should never be done in rainy weather, nor when the ground is wet.

7. If the flax is to be propped, this work is best done at the time the crop is weeded.

N. B. To prop flax is to fix supporters about the size of a man's finger, branched a little at the top, and

and about three or four feet long, at the distance of every yard. If the flax grows to the height of three or four feet, this precaution is indispensably necessary, on account of the violence of the winds in this country.

In what manner and at what time Flax is to be pulled.

1. As soon as your Flax in general begins to turn yellow at the foot of the stalk, it is time to pull it, though the seed should not be quite ripe, it will ripen on the stalks whilst they lay on the land.

2. This work should be done in dry weather.

3. If the flax is not all of equal ripeness, the ripest must be carefully picked out; for if it is all grassed together, that which is not ripe will rot before the other is sufficiently grassed.

It is also best first to pull the longest, and afterwards the shortest, and to keep them seperately, but this must be done all at one time. By observing this method, there will be fewer hards, and of course more flax, when it comes to be dressed.

5. Immediately after the flax is pulled, it must be spread on grass ground, or on a stubble. The seed end of the stalk must be laid towards the south, that it may ripen the better. This will take a fortnight or three weeks, according as the weather is, hot or cold, wet or dry.

In what manner the seed is to be seperated, and what is afterwards to be done.

1. When the seed is ripe, the flax must be tied in bundles; and in dry weather, when the sun shines, it is to be got under cover.

2. That the season for grassing it may not be missed, the seed should be seperated immediately after it is got in.

3. For this purpose if you have a large quantity
of

of flax, the most expeditious way is to get it threshed by one or two men in the following manner.

You must make some pretty thick beds, the heads of the stalks must touch the barn wall, and over the feet of the stalks, the whole length, a very heavy plank is to be laid, that the flax may not be scattered in threshing. The wall, by confining the threshers, will prevent them from striking too hard, and thereby damaging the flax. This method is very good, and does not take up much time.

4. If you have only a small quantity of flax, it may be rippled in the ordinary way; but you must observe not to let them take too large handfuls, as that would spoil a great deal of flax.

5. After having separated the seed you must let it lie in its capsule on cloths, exposed to the sun, for several days, and afterwards you are to keep it in a very airy place, but not lay it too thick, observing to stir it every two or three days for the space of three weeks. When this is done, you may preserve it in this state for two or three years, without its being injured in its quality; but flax seed being once deprived of its capsule will scarcely ever keep above a year.

6. In order to separate the seed from its capsule, it is much better to send it to a proper mill than to thresh it again, which must undoubtedly damage it.

7. After having cleansed the seed as much as possible with the fan, it must be passed through two sieves; the first should have oval holes of the shape of the seed, just large enough to let it pass. By this means all round seeds, and other heterogeneous substances, unless they are very small indeed, will remain in the sieve. After this has been done, you must put your seed into another sieve, with very small round holes, through which the flax seed cannot pass. All the smaller seeds of weeds will escape,
and

and your flax seed will be as clean as you can well make it.

Of grassing Flax.

After the flax is rippled it must again be spread on a grass field, but rather thinner than it was the first time, and on grass that has been mown about a fortnight. On this occasion it is necessary to observe:

1. That in dry years the flax should be spread, if possible, on damp ground, and in rainy years on dry lands.

2. Care must be taken never to spread it on wet meadows.

3. The flax must be carefully turned whilst it is on the ground, that all parts may come forward alike. If the weather is wet, and there are heavy dews, it must be turned at least every other day.

4. It is impossible to say exactly how long the flax will be in grassing, this depends on the quantity of dew that falls, the coarseness or fineness of the flax, and the heat and cold, dryness and wetness of the weather: but if in bruising betwixt your fingers, the top of the stalk when it is dry, the harle or bark separates easily from the boon or woody part of the stalk, and this last is not tough but brittle, the flax must be taken from the ground, set up an end, and as soon as it is dry, it must, in fine weather and at noon, be tied up in bundles, and carried under cover.

5. If in pulling the flax that which was ripest was separated from the unripe, it will be found that this last will be ready to take up some days before the other.

At what time and in what manner it is proper to brake Flax.

1. The heat of the sun contributing much to the braking of the flax expeditiously and without damage,
it

it is necessary that this work should be done, if possible, before autumn, and always in fair and hot weather.

2. On account of the danger from fire, this work should never be done near houses, much less in stoves or ovens; and indeed our laws forbid it under a heavy penalty.

3. In this country the best way is to dig a hollow place in the earth, two feet deep, three wide, and from twelve to fifteen long, lining it with stone; over which, at the height of about four feet, is fixed a griddle, consisting of small poles, securely fixed on four or six piles, or stakes, driven into the ground.

4. In this hollow place, when the weather is fine, a fire is made to dry the flax. The most proper fuel for this purpose is either charcoal or well dried turf, as well because with these an equal degree of heat is more easily preserved, as because they neither of them produce much smoke or flame.

5. In spreading the flax on the griddle, care must be taken to make the beds thin, and to dispose of them in such a manner, that all the stalks may dry equally as nearly as it is possible.

6. Matters must be so managed, that the men who brake the flax may receive it quite hot; of course a sufficient number of hands must be employed, for by braking the flax whilst it is hot the work is greatly forwarded, and the flax is, beside, made cleaner and less damaged in the operation.

7. The workman, who brakes the flax, must not be permitted to bruise it first in the middle, nor on that side of the brake that is next the handle, but he must begin at the crop end of the flax, and on the side of the brake opposite to the handle; for braking the flax is not effected by dint of blows, but by pressure; to do otherwise, would be taking a great deal of trouble to do mischief.

8. The

8. The parts of the brake must not be let too much one into the other, and the under part should be moveable to yield with the more ease.

Precautions to be observed in beating Flax.

There is little to be said on this subject, except that flax, in order to be made fine, should be beat; it is this will clean and make it properly supple: but great care must be taken not to beat too much at a time. If the flax has been properly grassed and braked, if it is neither too green nor too coarse, it may, without any danger, be beat above an hour. It is almost unnecessary to observe, that during this operation it should be frequently turned.

An observation of great importance respecting the hackling of Flax.

As dressing of flax, particularly hackling it, cannot be executed by an ignorant person, but must be regularly learned as a trade, requiring knowledge, dexterity, and long practice, I shall not enlarge on it in this place. Yet I cannot but with regret observe, that quantities of our best flax are so spoiled by the ignorance of workmen, as to sell for less than half value, besides greatly injuring the quality of our linnens. It is then necessary, that without loss of time such flax-dressers, as are able and expert, should be encouraged to take apprentices, whom they may perfectly instruct in their business; and there is not the least doubt, but that this would be of infinite service to the community, and promote our manufactures.



ARTICLE XXXVIII.

An Experiment to make Potatoes thrive without Dung
by Mr. TSCHIFFELI.

I PROPOSED plowing several times, either in the spring or during the summer, a piece of ground, containing about half an acre, of an indifferent quality, the soil inclining to sand, intending to apply it to some other use. The preceding year Saintfoin was sown in it, but it failed entirely, insomuch that the person who occupied it before me had already caused it to be plowed in the autumn of the year 1760. I was on this occasion willing to try whether by following the directions given by Mr. du Hamel I could get a crop of potatoes from it.

I planted accordingly some in straight lines, two feet asunder, and the plants forty inches distant in the rows, plowing the intervals three times in the summer, that is to say, every six weeks.

The plough that was used was very light, and without wheels, and with two horses going one before the other, it was very easy to draw two furrows about five inches deep, without much damaging the roots.

My workmen, at first, smiled at my attempt: the potatoes sprouted but slowly, and did not seem to promise any great success; but after the first plowing they got forward, and after the other two plowings were to the full as forward as those of my neighbours, which had been plentifully dunged. Finally, after the third plowing, every one was astonished to see

see that the stalks of my potatoes, which had not been at all dunged, were fresh and green, when the stalks of the others, which had been dunged, were turned yellow, withered, and almost dry.

In a word, this piece of ground yielded me in autumn half as many potatoes again as the same quantity of land would have done in the ordinary method of planting, and these were all of a delicious flavour, without reckoning what were given to the hogs on account of their being either too small, or damaged by worms.

This small experiment will encourage me to adopt the same method in succeeding years, and in enclosed fields, when they are intended to be fallow, planting them with various roots.

In this manner may we follow the directions given us by Mess. du Hamel and de Chateauvieux, without being apprehensive of any loss ensuing. The careful husbandman may always promise himself success by adopting this method, and he will be delivered from the pernicious weeds which now constantly infest his fallows.



ARTICLE XXXIX.

An Experiment of sowing Bere, or Winter Barley, in Autumn, to serve as green Fodder for Cattle in the Spring, by the same Gentleman.

IN the month of September, 1760, I caused two bushels of Bere, or Winter Barley, to be sown, intending to mow it in the spring, to serve as fodder for my cattle. Being informed in the year 1761, that Bere, after being mown at a proper season, and before it spindles, will still attain a perfect maturity,

I left it for seed, after having mown it three times, in April, May, and June.

In the beginning of August I got in fifteen bushels of excellent full ripe Bere. The fodder I got from it, and which was given to the cows, sometimes mixed with clover, and sometimes with Saintfoin hay, appeared to be very succulent and nourishing.

The soil on which this crop grew was of a middling quality, inclining to be gravelly and light, and had in the year 1760 yielded a plentiful crop of summer rye.

No kind of manure was laid on at the sowing of the Bere. The success of this experiment encouraged me to sow last September eight bushels of Bere in the same manner, of which I hope to have a good account.



ARTICLE XL,

The Farmer enriched by artificial Pastures, or the true Application of cultivated Grasses, so as to improve and encrease the Value of Land. By Monsieur DE L'HARPE of Switzerland.

INTRODUCTION,

MY father's house was the school in which I learned all I know of agriculture; above thirty years have I been a witness to the very great advantages which may be, and are derived from the well regulated

lated culture of artificial grasses. All I had to do was to follow the example and attend to the precepts of a wise father; I now reap the benefit resulting from this attention, and am willing to participate with mankind in general this knowledge which has been so useful to me.

But it may possibly be asked, is there any occasion for the publication of this treatise? Is not more already written on the subject than the world approves of? These questions I say may be asked, and it would be highly improper should I leave them unanswered.

The several works which have been written on the subject of husbandry, furnish me with an additional inducement for the publication of the present Essay. Patullo in his treatise *Of Improvements*, and Des Pomiers in his *Art of growing speedily rich*, &c. exaggerate matters greatly, and promise more than they can any ways make good, more than they ought to do, and in truth more than there is any occasion for. On the contrary, the Author of the preservative against the pretended *Agromania*, with which people have been said to be infected, seems to have a peculiar satisfaction in depriving us of every hope of succeeding in our attempts to better ourselves by agriculture. If you follow the instructions so fully and so flattering laid down by the first mentioned Authors, it is necessary you should have a resolution, a constancy, nay, we may even say an obstinacy of perseverance, not to be discouraged with the first results of your painful, expensive, and perhaps tedious experiments, when to your great disappointment you find your crops so much inferior in quantity to what you had been taught to expect, and had most probably flattered yourself with the hopes of. If, on the other hand, you place an entire dependance on the theory laid down by the last mentioned writer, you will

will be backward in employing yourself in any thing that relates to husbandry ; you will leave it to be still engrossed by the ignorant landholders, who have so long tortured the earth with their stupid and ill-judged practices, and unconcerned will you perhaps see it sink, unassisted, under the oppressive weight of long used customs and idle superstitions, which cannot consistently with reason or experience be defended or approved of.

Yet after all, the advantages which are to be derived from artificial pastures are considerable enough, and sufficiently obvious, to attract the attention of every man who has only a tolerable share of common sense : for this purpose nothing more is necessary than to lay them before his view with candour and ingenuousness, without exaggeration, and without any the least disguise or art. This evidently necessary task has not yet been performed to any purpose, and this it is which I shall attempt doing in the treatise I am about to write.

I shall not be content with saying that such an extent of land will produce such a sum of money, arising from the sale of the artificial grasses which grew on it : this account, tho' given with ever so much integrity, would afford but very little or no instruction to the farmer ; as the produce must be greatly influenced by the situation of the land, the goodness of the soil, and many other relative circumstances.

It is necessary, if we would afford the intelligence he is desirous of having, to specify the sum of the produce in kind, the quantity and quality of the produce is what he chiefly wishes to be made acquainted with, that he may the better be enabled to judge, whether the methods of practice, by which this crop is procured, can with any degree of propriety be adopted by him.

I could,

I could, it is true, without much difficulty tell the reader, that such or such a quantity of a particular artificial grass was the largest crop I had known to be produced; but that the common or ordinary produce, on which alone the intelligent farmer ought to depend, taking the crops one with other, amounted only to such a lesser quantity. And I could add to this account, that with the produce of such crops taken on the average, I could maintain such or such a number of cattle of a particular kind which would be worth such a sum; and that so much would be the clear profit, equally applicable in all places, at least after making, according to circumstances, certain necessary alterations and allowances.

The order in which I shall arrange the subjects of this piece, as they occur, is as follows:

I shall in the first place give some account of such of the artificial grasses as are most commonly and generally cultivated as fodder for cattle. I shall enlarge a little on their qualities, point out how far one is to be preferred to the other, describe the manner of preparing the land for the reception of the seed, and give such rules for their culture, as I may think any ways necessary for the instruction of the honest farmer.

As it is indispensably requisite, at least if we would wish to derive any advantage from the culture of them, that artificial pastures should be plowed up in order to their being from time to time renewed, I shall point out what intermediate crops of grain the farmer may expect his land will produce him, before he again lays it down in any of the artificial grasses.

I shall in the next place, from the methods I have myself long practised, give some good rules respecting the manner in which the farmer ought to manage his land, that is, how he ought to apportion or divide it if he means to follow my method of culture.

I shall

I shall lay before the considerate reader the advantages to be derived from this method, compared with those which farmers in general now reap from the old methods of practice, and from such lands as are kept always in tillage.

I will then fully and plainly demonstrate, that when my method of husbandry is once to purpose adapted, the advantages to be derived from it are not only greatly superior to what is got by the ordinary practice, but that it is also as easy and as little intricate for the farmer to follow.

I have another thing also to mention, that will perhaps be a singular satisfaction to our indolent landlords, which is, that the farmer or landholder may occupy his farm, and work it in no very different manner from that which has for ages been practised.

I shall finally examine the several difficulties which may be objected, as being inseparable from this plan of husbandry, particularly those which are thought to be the least easy to obviate.

If I make it appear that every thing I have asserted in this introduction is practicable, and must turn out to the farmer's advantage, it will, without doubt, be allowed, that this treatise may be of some use; if, on the contrary, I should fail of success in this my attempt to benefit mankind, the zeal by which I am actuated cannot but be approved of by the worthy, the disinterested, the good natured part of the world.

Critics may and will possibly find fault with my putting in the front of this piece what they may esteem so quaint a title; yet can I by no means think it improper, as the farmer must needs grow rich if a method is pointed out to him by which his profits shall be at the least doubled to him, and that not for a short space of time but for a continuance.

CHAPTER

CHAPTER I.

Of the Advantages to be derived from artificial Pastures.

IN the Dutch Edition of the memoirs of *Trevoux* for the month of May, 1762, p. 178, I find the following passage extracted from a book, call'd, *Preservatif contre l'agromanie*; a preservative against the Agromania. *Les prairies artificielles peuvent être de quelque utilité, mais l'on en a trop exalté les avantages, et il est certain qu'elles ne sont point à comparer aux anciennes, &c.* Artificial pastures may, possibly, be of some utility; but the advantages to be derived from them have been too much exaggerated, and it is certain, they are by no means to be compared with the old pastures, &c.

I acknowledge that the accounts given relative to this matter may very possibly have been exaggerated, by giving us room to expect profits which we can at no rate promise ourselves, unless our land is very favourably situated indeed; as for example, in the neighbourhood of a great town: and it would have been much better, if the quantity alone of the fodder, which the land would produce, had been specified, without saying any thing about the value of it.

After having made this confession, I think I may venture to assert from my own knowledge and repeated experience, that artificial pastures may be of great utility to the farmer, and it is but justice that I reproach this writer either with being ignorant of the subject he writes on, or, what is still worse by far, with being guilty of gross and evident partiality, as it must on all hands be acknowledged, that he does not afford to the artificial pastures that justice which they abundantly merit; and I do not found this assertion on hear-say, the report of others, or on accounts

which I have read in the works of prejudiced, and, perhaps, in some measure partial authors.

“ When the profits arising from my estate are increased in almost a treble proportion (to what I should at any rate be able to receive without their assistance) by the means of artificial grasses, and when I have very reasonable expectations, that this improvement may still be much farther extended. When I see that every one who applies himself with any tolerable degree of prudence, attention, and knowledge, to my method of husbandry, reaps nearly, if not quite the same benefits from it that I do myself, should I do well, or act with integrity, if I expressed myself after this manner: *Artificial pastures may possibly be of some utility to me? To do common justice, ought I not to say, Artificial pastures are of very great utility to me, and to them do I in a great measure owe the ease, affluence, and independance which I now enjoy.*”

I shall not, till I come near the conclusion of this treatise, make any comparison of my method of husbandry, assisted by artificial pastures, with the advantages to be derived from the old fashioned husbandry commonly practised; it will at present be sufficient to point out two benefits resulting from this culture, which cannot be contested or denied. The first is the great increase of fodder, the natural consequence of which must in course be a proportionable increase of all sorts of cattle, with a diminution of labour. The second is, the great encrease in the profits arising from a farm, and consequently the value of the land will be raised, as well as the rents to the landlords.

If I had any intention of recommending the breaking up of good meadows, where there is a command of water, in order to their being sown with artificial grasses, people might indeed, with some shew of reason, exclaim against such strange and out of the way

way advice, which could not fail decreasing the profits arising from them, making them much more uncertain and precarious than they now are, and involving the farmer in a train of difficulties.

This is by no means my intention, on the contrary, I would have such old pastures, as yield but even middling crops, left in the state in which they now are, at least for the present I desire not any change to be made in them. Neither do I comprehend the rich lands which lie in the vallies between the mountains, where but very small quantities of corn are in proportion grown, and where the best fodder of every kind is to be met with in the greatest abundance.

Without encroaching in any sort on such lands as I have been describing, there is still abundant room for cultivating artificial grasses in the greatest plenty. How many pastures, commons, and sheep-walks have we, which yield scarcely any profit, either to the owner or landholder? How much land have we, which when mown, yields not one year with another half a load of hay from an acre? In these, if the soil is at all suitable, the artificial grasses may to the greatest advantage be sown.

It is particularly worthy of notice how small the rents and profits arising from some lands in tillage are; an amazing number of acres are every year but half tilled, for want of manure to give them proper dressings, and cattle to plow them as they ought to be. If this is the case, as it really is, surely some thanks are due to the man who, in dispensing with a part of the labour and plowing now requisite on a farm, shall point out to us a method of growing a quantity of grain equal, if not superior, to what we have for many years enjoyed, and at the same time instruct us how we may be enabled to maintain, without comparison, a much greater number of fine and

valuable cattle? All this may we enjoy by adopting, without delay, the cultivation of artificial pastures, and for this purpose it is that I so strongly recommend them to the attention of the farmers. Let a certain proportion of our land be dedicated to them, and less of it will be left to plow, yet this lesser quantity, which of course must be better tilled, and cannot fail being much better manured, will yield us a larger produce of grain than the whole ever before did.

It may perhaps be admitted, that the quantity will be encreased, but then it will be asked, whether it will be so far encreased as to pay the rent of the land and the expences of this method of culture. To this I answer in the affirmative, if the soil is well adapted, and the husbandry, I propose, is carried on in a careful prudent manner. I shall mention for example Saintfoin, and all I shall say on the subject will be founded on my own constant experience. I do not assert that the farmer shall get such large crops as I have seen on some enclosed grounds, where neither plowings nor dressings were spared, as these yielded from three to four loads of Saintfoin from an acre for several successive years; but I can venture to say that land of a moderate quality, and which has been pretty well plowed, shall yield one crop with another, for seven or eight years, from a load and a half to two loads of Saintfoin from an acre.

I may safely add to what I have said, that this crop is less subject to casualties than the natural grasses. When once the Saintfoin has taken firm root in the land, it will be injured but in a very slight degree by the greatest drought, so that in dry summers this plant proves to the farmer a resource truly valuable, without this help he would scarcely know how to subsist his stock, as is too often proved by such as cultivate it: it will, in such seasons

seasons, grow in places where it has not been sown in the memory of man. In the neighbourhood of one of my Saintfoin fields I had a piece of land, where it grew very vigorously, and it came up in such plenty after a dry spring, that it yielded me more fodder than the natural grass which it had succeeded. In saying this I have mentioned an advantage which is almost peculiar to Saintfoin; but that I may lay every thing relative to the subject in an impartial manner before the eye of the judicious farmer, I shall next mention some of the disadvantages attending the culture of this plant.

I acknowledge with the greatest candour that Saintfoin will not make cows give so much milk, cream, &c. as the grass of rich water meadows; yet is this disadvantage in some sort ballanced, by its affording cattle plenty of excellent and sweet nourishment, and making them soon fit for slaughter. I know of no fodder which agrees so well with hard working cattle used in draft, particularly horses; my horses, which scarcely ever taste any other food, do their work with spirit and alacrity; and what is of very great consequence to the farmer, never ail any thing. In the winter season I feed my cows with Saintfoin hay, which keeps them always in excellent case; and in the spring they are almost fit to be sold to the butcher for slaughter, being half fat.

I shall with equal candour acknowledge another disadvantage attending the use of this fodder, it spends rather faster than hay produced by the fine natural pastures, at least the first cutting of it does so; because the stalks of the Saintfoin, being harder and of a more woody substance, must consequently be less nourishing. This difference in the spending of the two sorts of fodder, I have, in the course of my experience, fixed at about one sixth part; for I find that five hundred weight of the very best and
finest

finest hay, without any mixture of couch, weeds, &c. (I mean not coarse hay from a low wet meadow) will last as long as six hundred weight of Saintfoin hay. But I must in this matter at the same time observe, that I am very much inclined to think, that if I had myself undertaken the management of my fodder and feeding my cattle, I should have found no difference at all, the difference chiefly proceeding from the waste made through the negligence and carelessness of the servants, who must in some cases be trusted.

Yet after all, what consequences can be inferred from these two candid acknowledgments? excepting that the benefit resulting from the using of Saintfoin will be diminished one sixth part; and when every allowance is made, it must still be confessed, that the quantity of fodder will be increased, and of course the number of cattle kept on a farm, if the occupier pleases. On the other hand, the work to be done on the farm is lessened in proportion to the quantity of land that is cropped with Saintfoin, by which means the profits cannot fail being increased. I shall not just now attempt making any calculation, as every farmer must be satisfied of the truth of what I have advanced by this simple exposition of matters of fact. I now proceed to the second Chapter, in which the reader will probably find something very well worth his most serious attention.

CHAPTER II.

Of the artificial Grasses which are most commonly cultivated, their several qualities, the crops they yield, their duration, the choice of soil for them, and the several preparations necessary for their culture.

THE various terms made use of in different provinces to express the same thing, often occasions a
confusion

confusion not easily to be got over, and this is particularly observable in the names that are given the several sorts of artificial grass. That which the Parisians call Saintfoin, the inhabitants of Dauphiné name Esparcet or Esparcette. As the people of Switzerland first procured this plant from the Dauphinois, they of course call it by the last mentioned name; calling that plant *Sainfoin* which is in almost every part of France known by the name of *Lucerne*. This confusion might easily be remedied if farmers would but once agree to call the same thing always by the same name.

The first of the artificial grasses which I shall take notice of, is *Lucerne*, or as we often call it, Saintfoin, with violet or purple coloured flowers. This plant is greatly prized, on account of the quantity of fodder which it yields, for in a rich soil it may be cut six times in the space of one summer; in such a soil, an insulated plant will become as large as a moderately sized shrub; I can at this time, produce several plants which have roots full as large as the arm of a strong robust man. I know also by experience, that this plant thrives extremely well, when cultivated according to the principles of the new husbandry practised by M. de Chateauvieux; and they are the plants cultivated in this manner, which have the roots so large as those mentioned above. But if the bind-weed once attacks these fine plants (which was the case with me) they dwindle by degrees, and perish, so that the whole plantation must be plowed up. These pernicious weeds cling to the stalks of the *Lucerne*, and choak the plants as they rise, but the truth is, *Lucerne* is very impatient of any sort of weed which grows near it.

Though my *Lucerne* plants were in a very thriving state, yet the bindweed had no sooner attacked them than they died, notwithstanding I caused their
stalks

stalks to be immediately cut. Every farmer knows the havock this weed will make amongst clover. I have found it in the natural pastures; but not meeting here with the support which it requires, it soon dies, and is carried off with the wind. I have seen this weed in blossom, and with the seed ripe; the seed is nearly of the same size as lucerne or clover seed, &c. I shall in this place remark it once for all, and I shall not have occasion to repeat it when I come to treat of clover, that the best way of getting rid of this weed, is to raise your own feed both from lucerne and clover.

But to return to lucerne. This plant requires a light soil; that which agrees best with it being a light, rich, sandy loam, which may not improperly be called the best land most farms afford; it may therefore be no very easy matter to introduce the culture of lucerne in any very extensive degree. If the farmer has a piece of land within a reasonable distance of his yard, let him sow as much of it with lucerne as he can water with the drainings of his dunghills, and he will find that the amazing produce of this plant will sufficiently indemnify him for all the trouble he can take in its culture, and his cattle will have plenty of green fodder during the course of the summer.

Rye grass is often sown with us, and if it is cultivated on a stiff moist soil, the farmer will not have reason to complain; but I have not included this plant within my present plan, in the first place, because we must procure our seed from abroad, that which we save seldom succeeding; and this makes the culture of it very expensive. Secondly, this plant yields less crops than almost any other kinds of cultivated grass, and when the cattle have tasted any other fodder, they are with great difficulty brought to eat this again. Any farmer who chuses
to

to do it, may however cultivate this plant, according to my plan of husbandry, if he will but take care to bear in his mind the time which it will continue with profit on the land, and regulate matters accordingly.

I shall in this little treatise chiefly confine myself to clover and faintfoin, as the long experience which I have had in the culture of these two plants has given me a perfect knowledge of them.

It is needless to give a particular botanical description of them, as they are well known plants; and the truth is, I might acquit myself but badly in the task.

To begin with clover, I shall in the first place mention the proper time of sowing it. The broad clover with red flowers, is the *trifolium pratense purpureum*, and is with us (in Switzerland) sown generally the latter end of April, or the beginning of May in moist weather, or when rain is expected in a short time to fall.

Clover thrives best on a mild tractable soil, rather stiffish and moist than light and dry, and the land should also be well manured. It is a common practice after having well plowed and dunged the land intended for clover, to sow it in autumn with wheat, and the clover is afterwards, in the spring, sown on the green corn; the farmers, not without reason, being of opinion, that the wheat plants guard the young clover whilst it is yet in a weak and tender state, from being scorched up by the violent heat of the summer's sun.

The quantity of seed to be sown comes next in question; about eighteen pounds on an acre is sufficient, and though the seed of clover is very small, a little practice enables the country workmen to sow it very regularly, either by itself or mixed with sand. If the season proves favourable, the young clover

plants begin to get forward apace immediately after the wheat is carried off the land, and the farmer may expect a small crop even the first year. Sometimes, indeed the dryness of the weather prevents it from shooting with any degree of vigour the first autumn, however, the plants nevertheless live through the winter, and thrive equally well the second year.

With respect to its duration as a crop, it may last four or five years; but the roots of clover spreading laterally, and running no great depth into the land, the plants become feeble, and the produce is but very indifferent after the third year; besides, if the clover seed should happen to be mixed with the seeds of weeds, as all that comes from France is, these weeds the third year get to so great a head, and propagate so fast, that there is scarcely room left for the clover to grow.

My experience on this head prompts me to join in opinion with M. Patullo. If you reckon as the first year that in which the clover was sown, I would recommend that it should be mown for the space of two years; and the fourth year, after once mowing, it should be plowed; whatever plants remain, will serve as manure for the land, and be of great service to whatever sort of corn is afterwards sown; in following this method, you will be sure never to impoverish your ground.

With respect to saving the seed of clover, I shall not enlarge much. The best seed is saved from the second cutting of the second year; and the best way is, after determining the quantity of seed that will be wanting, to leave for this intent, the parts of the field where the plants are the finest, and in the most flourishing condition. When the flowers are dry, women may be sent in to cut them with reaping hooks, and carry them directly under cover in cloths; the plants should then be thrashed in the barn,

barn, or what is better still, the seed should be separated by a machine for the purpose; the caving sieve and fan will serve afterwards to dress what seed has been thrashed, and by these means the farmer will have as much as he wants, and clean enough for his use.

Let us now examine a little into the produce of clover; the second year certainly yields the largest crop. It is customary to cut clover as soon as it is in flower, which, in this country (Switzerland) generally happens about the end of May. If the season is favourable it immediately makes new shoots, and flowers again about the end of July, when it is to be mown a second time, and the last mowing is generally some time in the month of September.

The three crops of the second year may very well be estimated at three tons for each acre of land. The third year there may also be three cuttings, which we will estimate at two tons per acre. Add to this, one ton and a half per acre for one cutting the fourth year, and for the cutting, which, as I have already observed, may probably be obtained the first year, and it will be evident, that at most eighteen pounds of seed will, in the space of three years, have produced on one acre of land, near seven tons of fodder. This is more than sufficient to make amends for the quantity of dung which was laid on, for I always found when I had plenty of litter, that one load of clover hay would yield me at least three good waggon loads of dung.

It will certainly be expected I should say something relative to the qualities of this fodder. It cannot be denied, but that clover is most excellent food for cattle when it is given to them green, and they are permitted to eat it under cover: but it is to the last degree imprudent, ever to suffer cattle to eat it on the land on any pretence, and at any time whatever;

too many fatal proofs might be given in support of what I here assert.

[This is certainly saying too much, but our author was not probably acquainted with the English methods of husbandry. He adverts to the danger there is of cattle being blown or hosed, by their being allowed full liberty to graze clover. Our English farmers, however, know by experience, that there is not so much danger in it as seems to be here represented; some care is certainly necessary, and with care few accidents happen. Clover is very succulent, therefore when it is cut for cattle to eat green, it is best to let it lay and wilt a little before it is given to them.]

We must besides remark, that clover requires finer weather to make it into hay than almost any other plant; two or three showers of rain falling on it after it is cut spoils its colour, making it black; and let this hay be made in ever such fine weather, it will nevertheless shed and lose a considerable part of the leaves which were on the plant. It is not impossible but a remedy might be applied to this inconvenience: suppose it was to be housed before it was quite dry, and that it was stacked with dry straw in alternate layers, this might probably be found to answer.

After all I cannot but be of opinion, that clover hay is not only greatly inferior both to meadow and upland hay, but even to Saintfoin, which is certainly more wholesome, if it should not even be allowed to be more nourishing.

[That clover hay is not so sweet feed as meadow may readily be allowed, but it is notwithstanding very nourishing good food for slow drawing horses, and the only danger is its enriching their blood too much. Farmers are well acquainted with its excellences, and know how much corn it annually saves them.]

them. No horses are in better order, or work with more chearfulness, than those which are fed on clover hay.]

After having said so much on clover, I shall now lay down a few rules respecting the culture of Saintfoin.

I am very sensible that much has been writ on the subject, therefore what I am about to say may be deemed superfluous. For this reason I shall confine myself to making only a few remarks, which, notwithstanding all that is to be read relative to this plant in a variety of authors, will, I am opinion, be thought useful by many.

To begin then, every situation is not equally agreeable to this plant. It prefers light soils provided they have a fall. I have seen it in a sickly condition on stoney soils, lying almost flat, when it has at the same time thriven well on some stiff but sweet lands, which had no greater fall. In general it is most suitable to this plant to find at the depth of a foot, or a foot and a half, a bed of gravel; but then this bed must not run so deep, so as to prevent the root from penetrating through it to a greater depth in search of moisture and nourishment. I have at this time a field of Saintfoin on such a soil, which has already lasted upwards of twenty-five years, and is yet in good heart. By boring to the depth of about six feet, you may easily judge whether the soil of a field is adapted to this plant.

As Saintfoin sends forth a long tap root, and will not admit of any other plant growing near it, it is absolutely necessary that the land should be deeply plowed, and very well prepared, before the seed is sown. A great deal depends on this, and if the farmer chuses not to be at this expence, he had better lay aside all thoughts of sowing Saintfoin.

The general practice among the peasants is to sow
three

three times as much Saintfoin as wheat ; but this is a great waste. I sow it only in a double proportion ; that is on land where I would sow three bushels of wheat per acre, I sow six of Saintfoin : and I have at this time some growing, which was eight years ago, sown in this manner, and yet is thick enough on the land.

If a farmer is not certain that his seed is good, he had best not sow it ; for plants, which come up feebly, like weak or consumptive children, will either languish through life, or be choaked by the grass which will eagerly press to consume the nourishment which was not intended for its use.

With respect to the most proper times of sowing farmers differ much in opinion.

If the spring is tollerably moist, Saintfoin will succeed very well sown at that season of the year with oats ; but it is much the best way not to run the risque of a dry spring, and to sow it sometime in the month of August.

A great deal depends on the time in which the seed should be saved.

Experience confirms it to me, that Saintfoin grows more vigorously if it is suffered to ripen its seed the first year. It is my constant practice so to do ; in the other years I save the seed in patches, where the plants seem to be in the most flourishing and thriving condition ; and this method of acting always answered extremely well with me.

My method of saving Saintfoin seed, which follows, is neither expensive nor difficult in the practice.

When the husks of about half the feeds are changed to a colour inclining to grey, I cause my Saintfoin to be mown before the dew is off the ground in the morning. The workmen must be very careful, mowing it with a smooth even stroke, without

without jogs or jerks, and with cradles to their scythes, that the heads of the plants may all lay one way.

When it has had three or four hours sun, it must be gently turned.

The next day, as soon as the dew is dispersed, your workmen may overrun the swarthes, being first provided with cloths fixed to slight frames. There must be three workmen to every cloth; two of them take up the Saintfoin gently with their forks and lay it on the cloth, beating it with the back of the forks; they turn it and beat it again, throwing it afterwards aside. The other workman, (but this may be a woman) follows with a rake, and, as soon as the two first have taken away the cloth, rakes the scattered straw up to the heap they have made.

When the cloth is fully charged with seed, dust, and chaff, it is emptied into some proper receptacle prepared for the purpose, and a fourth workman carries it in a cart or waggon into the barn, where it is dressed and cleaned when occasion serves best to do it.

These three workmen, exclusive of the carter, can thresh in this manner above three good waggon loads of Saintfoin in a day, and, according to its yield, will get in from fifty to one hundred bushels of seed; this, considering the price at which Saintfoin seed sells, is well worth the farmers while to do.

The loss in the article of fodder is not so much as may be at first imagined, for though what has been threshed in this manner is rather hard and sticky, yet the horses and oxen will readily eat it, as well as the dust and chaff which was carried into the barn with the seed.

I recommend this method of saving Saintfoin seed as the very best I have any knowledge of.

As

As some who cannot have much experience in the matter have published things to the disadvantage of this plant, I think it necessary to observe in this place, that there is no kind of cultivated grass which dries so readily as Saintfoin, or that is less subject to turn black, or to heat in the stack.

That I may not be in danger of losing the small leaves, which I esteem the most precious part of the plant, I generally take care to gather it for carrying before it is over dry, and I never, in all my practice, had a single ounce of this hay which my cattle refused to eat.

Every experienced farmer being sensible that this plant is not so full of sap as many others, will perceive that what I say must necessarily be true.

I have already mentioned, in the first Chapter of this short treatise, what quantity of this fodder may be expected one year with another for the eight years which I allow it to occupy the land; there is not the least doubt but that this plant would remain longer in soils best suited to its nature, and if some degree of occasional culture was bestowed on it. But generally speaking, where a considerable number of acres are laid down with it, this term of eight years cannot with any degree of advantage be prolonged; I am therefore of the same opinion I first declared myself, and my own experience confirms me in it.

It would be very easy for me to write a volume on the subject of the culture of Saintfoin; but I am not fond of repeating what others have with propriety and accuracy said before me: my readers must therefore excuse my not entering into a longer detail; and I shall now in the next place endeavour to lay the ground work of my plan of improvement.

[To be concluded in our next Number.]



FOREIGN ESSAYS, &c.

NUMBER V.

The Farmer enriched by artificial Pastures, or the true Application of cultivated Grasses, so as to improve and encrease the Value of Land. By Monsieur DE L'HARPE of Switzerland. (Concluded from our last Number.)

CHAP. III.

Of the Necessity there is of forming a new Plan of Husbandry: The Principles of this Plan explained.

IT has been a great hurt to agriculture, that farmers have not docility enough to vary their crops in a proper manner.

Our ancestors laid down such a plan of husbandry, as was conformable to the intelligence they could in those times acquire, but the ignorant cultivators of our age, know not how to make use of the helps that are afforded them. A few patches of saintfoin or clover are sown here and there, these are mown till they will scarcely yield any thing; they are then frequently plowed, without the farmer's knowing why or wherefore, for he is at a loss

what to do with an exhausted soil, which is almost totally impoverished.

This negligence is attended with many inconveniencies, for such must naturally be the consequence of this mismanagement?

In the first place, the farmer after having had plenty of fodder for his cattle, is suddenly deprived of a considerable part of it; whereas had he regularly replaced the pieces of clover or saintfoin as fast as they declined, with others newly sown, he would every year have had nearly the same quantity of fodder, and his farm would have been always in the same state of improvement.

In the second place, it must be admitted, that some particulars who occupy their own estates, make a greater advantage of them, even by the unhusband-like manner in which they sow saintfoin and clover. We do not see, nevertheless, that the bulk of the people, particularly the farmers who occupy the most considerable tracts of land, apply themselves to this husbandry, they have no taste for it; if, for example, we let one of them some pieces of land sown with saintfoin, for want of proper care, it is either not replaced at all, or it is done in a very injudicious manner.

Thus all that can be done in this respect, is to little or no purpose, the lands do not produce the crops which might reasonably be expected from them, neither are they of so much real value in sale as they ought to be.

I make such a sum annually of my estate; yet if I should be under a necessity of letting it at the end of three or four years, it must be for a rent not exceeding half that sum, and if I am inclined to sell it, I shall scarcely get ten years purchase (*in Switzerland*) for it.

It is then certain, that all we have been hitherto able to say, write, or prove by the most clear reasoning,

soning, has been of little efficacy, and that the most difficult task yet remains to be performed, namely, to apply to the plan of husbandry I recommend, all that has come to my knowledge on the subject of artificial pastures, and for this purpose to change, if there should be found any necessity of doing it, entirely all our ancient customs.

Some may object that this cannot easily be done, yet I aver, that this alteration, or rather entire reform in our husbandry, is not only indispensably necessary, but may also very easily be put in practice. Why should not we, as our ancestors did before us, plan a method of husbandry, conformable to such truths as are well known to us? Our peasants, our ordinary husbandmen, well know how to keep their corn lands in three courses, according to the old custom, are not they then able to count beyond that number, and if instead of three courses, we should recommend to them ten or a dozen, must we necessarily suppose that number to surpass their comprehension? Suppose the instructions given them should import, that *such a year, such a small quantity of land should be broke up, and such another sown in such a manner with saintfoin, and with such a quantity of seed.* I cannot but be of opinion, that if they are inclined to it, they may very well put in practice what has been laid down to them in a manner so very plain and explicit. The same may be said of clover, or any other cultivated grass, which may be found useful or advantageous for the farmer to sow.

I admit, that the farmers will not of their own accord introduce these alterations, if another is to reap the profit of them; but if the proprietor of the land cannot afford to introduce these alterations at his own expence, before he lets the farm, so that the farmer may have nothing to do but to continue or imitate the methods he sees already so properly

brought into practice, if the proprietor, I say, cannot do this, he can certainly explain to his tenant the method of husbandry he would wish him to follow, and at the same time advance money to pay some expences attending this method, which are indispensably necessary, or if he does not chuse to do this, let him engage that his tenant, if he will introduce the course of husbandry here recommended, shall for a certain number of years, enjoy all the benefit resulting from the improvement, at the same time divesting himself of the power of raising the rent of the farm during that term.

I could wish that the method I am about to recommend, may be carefully attended to, and I am fully convinced, that it may every where be carried into execution; at least if there are any obstacles to its progress, they are not such as nature, but human policy has thrown in the way, and which it is not my business to attempt to remove.

Before I explain my method of husbandry, it may very reasonably be required of me to lay down the principles on which I mean to found my plan; it will then easily be seen whether they are true, and they may either be brought to greater perfection, or altered according as circumstances may vary, by applying them to other cultivated grasses.

The necessity of the farmer's having a certain quantity of fodder for his cattle, I lay down as my first principle, hence I infer, that fodder is the life and soul of agriculture, for without fodder we can have but little dung, and that of a very inferior quality, consequently all goes on in a languishing feeble state.

If there are countries fertile enough to produce large and successive crops of corn, without the aid of dung, I write not for the benefit of the fortunate possessors of them, but the truth of my principle will

will still hold good with respect to my lands, and those of my neighbours.

My second principle is, that fodder should be procured by the farmer, in preference to every other crop, at least in the quantity he has occasion for; my first principle being as I have already observed, that fodder is the life of farming, putting all things in motion.

I am sensible that if fodder was to be raised on all our lands, the price of it would of course be greatly reduced, therefore as the sale of this commodity is not comprehended within the extent of my plan, I must explain this principle by that which immediately follows, namely, by mentioning what quantity of fodder the farmer should endeavour to procure himself.

This leads me to the third principle. It will be proper to have as much fodder as will be necessary to raise as large a supply of dung, as can with propriety and profit be laid on the land: and this quantity of dung is not so small as some may imagine, as the farmer might annually with advantage to himself, lay on his lands in tillage, double the quantity of dung to what is now in general allowed.

The fourth principle gives some insight into the nature of my plan of husbandry, as I assert it is very advantageous for crops of corn and of cultivated grasses to follow each other, both being by that means encreased, or in other words, the first crops of grain which shall immediately follow cultivated grass, properly broke up, will be better, suppose the land to be in other respects prepared in the same manner, than if the land which produced them, had before borne nothing but corn; and in the same manner the crops of the cultivated grasses which follow corn, on land properly prepared, will be

be better than if they were sown after grasses of the same nature with themselves.

It is well known, that the turf of pastures when turned down by plowing, by rotting forms an excellent manure. If to this, a few loads of dung, such as is usually laid on lands when they are sown, are added, the farmer may expect a much larger crop of corn, he has more straw, and the same quantity of straw yields more corn, and of a better quality.

The benefit is nearly the same after clover, saintfoin, lucerne, &c. in proportion to the number of plants which are left on the land; for if we suffer them to die, if we stay till there are scarcely any plants left, this superiority in the crops which we might otherwise have expected, vanishes and comes to nothing.

On the other hand, before any ground is laid down in cultivated grass, it should first be well tilled and manured, till it is brought into as good heart as when it was first plowed; twice or thrice plowing, nay all the plowing that can be given in the space of a year, will not be sufficient; this point is not gained, till after it has been cultivated several years, has been well dressed, and of course has produced several crops of corn.

All I have here advanced, I have myself several times experienced, without having once met with a disappointment; I can even venture to appeal in this case, to the judgment of all intelligent and experienced cultivators.

If they will reflect a little on what I have said, they cannot but be convinced, that experience speaks in my favour, being absolutely on my side of the question, and that my fourth principle is entirely well founded.

But this fourth principle well and maturely considered, naturally leads me to draw the following inference, from what has been already said.

“ As

“As I principally intend first to have a large quantity of fodder, and afterwards a great deal of corn, I shall certainly, with the help of cultivated grasses, make a considerable advantage of my land, if I alter the course in which they are at present husbanded, still bearing in mind the particular kind of grass which will produce most profit, the time this grass will continue on the ground, and the tillage the land requires to restore to it that *aptitude*, if I may be allowed so to call it, which it originally, and by nature, had to produce the grass in question; all these things duly considered, I apportion my land accordingly.

And as in the common practice the land is divided into three portions, because it requires three years to return to the point at which we begin, so I divide my land into as many portions, as I allow years to the growth of the grass in question, and to the corn which follows it; or to express myself perhaps more intelligibly”, *The number of portions into which the land is to be divided, should be equal to the number of years allotted for the duration of the cultivated grass, whatever it be, and the crops of corn which immediately follow it.*

Thus for example, if we mow saintfoin for eight years successively, and allow the four following years, either for the growth of corn, or for tilling the land, the division here should be into twelve portions.

But to succeed in this matter, we must pre-suppose that the farmer is well acquainted with the nature of the soil which he occupies, for that is first to be considered, and I confine myself to that kind of grass or fodder, which will succeed best with me.

It may happen, that one part of my land is best adapted to produce a large growth of clover, whilst on another part, it may be more advantageous to
 sow

few faintfoin. In this case, I very readily make two several divisions of my land, allotting one for clover, and the other for faintfoin, because clover will afford a quantity of excellent fodder, to be given green to my cattle, and faintfoin is most suitable for making hay, to be kept for use in winter.

The next necessary piece of knowledge, is the time which the grass I cultivate will last; I endeavour therefore to inform myself, how many years it will last on my land, yielding me all the time reasonable crops.

With respect to the duration of clover, it differs not much on the different soils, but this is not the case with faintfoin. In some soils, it will scarcely uphold itself four or five years, whilst in others, it lasts ten, fifteen, twenty, or more years.

In what manner then are we to judge of its duration, without having had experience of the soil?

To this, I answer, that if the upper coat of earth is only moderately strong, if a stiff clay is not immediately under it, at a small distance, but lays two or three feet deep, if there is a sufficient fall to carry off the water, that it may not remain soaking on the land, I say, that if with all these requisites, the land is properly prepared for the reception of the seed, we may assure ourselves that the faintfoin will live on it, at least seven or eight years, and that the last years crops will be very well worth mowing.

I must next acquaint myself, with the best method of bringing my land again into heart, after it has been under the cultivated grasses. If it has borne clover, I am to consider, that it has been on the land only two or three years, and when I come to turn it up, I shall find that two or three plowings will entirely consume the few remaining plants, if I therefore keep it two or three years in tillage, it will be fully sufficient.

But

But I must allow, at least, one year longer of tillage, to land that has been in saintfoin, because having laid a much longer time without culture, the soil will stand more in need of being reduced, as the saintfoin plants which remain, and the natural grass which has intruded, will not be so easily consumed, and this is the reason why the land should be more frequently plowed, that the soil may be reduced into fine particles.

It must be observed, that whilst the land in these intermediate spaces of time, is under the plow, it must be recruited with sufficient quantities of dung, as I shall hereafter note, and the encreased crops of corn, will amply repay the expence of the operation.

My principles are of a very general nature, and a great latitude is allowed. It is not my intention, that every farmer whose lands happen to be of the same nature, should confine himself to the same manner of dividing or apportioning them.

Though my principles evidently carry with them conviction, yet when they are put in practice, or applied to use, some degree of modification may be admitted. Thus it would be no inconvenience, or at least very little, if instead of dividing the land for saintfoin into twelve portions, the division should be reduced to eleven or ten parts.

If the method I here recommend is practicable, which the reader shall be convinced of, by the time he has read this entire treatise, it must be allowed, that it tends towards enabling the farmer to make the most of his cultivated grasses, improving land, not for a short space of time, but for a continuance, and even enriching all the land owners, who may approve of, and adopt the plan.

It is of little consequence to the reader, whether I borrow or not, the idea of this method of husbandry from any other person; with a small share

of penetration, he will find that I am indebted for it to no one ; that I pen such thoughts as are my own, and recommend practices which I have myself long experienced, to be worth attention. He will moreover, perhaps, find more clearness and solidity in my reasoning, and weight in my proofs, without any of those exaggerations, to be too frequently met with in the greatest part of the modern treatises on the subject of agriculture.

It will now be necessary to explain the manner in which we must proceed, to bring land into this order of culture, and to preserve a regularity in our method, when this is once obtained, and this will soon be done; but I hope I shall stand excused, if I afterwards digress a little, to shew how much superior my method of agriculture is, to that which is in common practised.

I have a natural love for a method which I can call my own, and whilst this love does not carry me any unreasonable lengths, I may surely, in some degree at least, be permitted to indulge it.

CHAPTER IV.

Method of reducing Land into this Mode of Culture, and keeping it regularly in it.

This chapter has two objects in view, both one and the other equally easy in practice. The first alone, requires some degree of attention and patience.

As soon as the farmer, who approves of, and is determined to adopt my plan, is in possession of land which can be adapted to this culture, he must begin by finding out what cultivated grasses for fodder, will best suit the nature of his soil, and the number of years it will last to profit.

Let

Let him then at his leisure, and not with hurry lay his plan of operation, regulating his conduct according to his particular convenience.

Suppose for instance, he determines in favour of saintfoin, and that his farm will not conveniently admit of being divided into twelve portions, nothing then need prevent his making but six portions, provided that the operation of laying down one piece in saintfoin, and plowing up another for sowing corn, is only practised on each double portion every two years.

Meadow, and even tolerable pasture lands, are excepted in my plan, as I have already observed at the beginning of this treatise. I comprehend within it only lands in tillage, and such bad grass lands as will scarcely pay for mowing the crop.

Having computed the quantity of this sort of land, a calculation must be made of what is to be sown every year, either in clover or saintfoin.

This calculation, and the division of the land, should be laid down upon paper, for the sake of being more exact and to help the memory.

Write thus for instance: Sowed with saintfoin, the piece marked with the letter A, in the year 1763. That marked with the letter B, in the year 1764, and thus of the remainder, till you come to the twelfth piece marked with the letter M, for the year 1774.

To this account, add the year in which every piece should be turned up, for instance, the piece marked A, in 1771, to be again sowed with saintfoin in 1775.

I would not have the honest farmer start, because twelve years are necessary to compleat this plan, and that for the following reasons.

1. As by this means all extraordinary expence will be avoided, except what will be necessary to purchase saintfoin seed the two first years.

2. The other parts of the land, may, in the mean time, be cultivated after the old manner.

3. With some additional expence, this term of twelve years may be curtailed one half, by sowing every year two parts, so that at the end of six years, the whole will be cropped; afterwards, all that is necessary to be done, is to plow up each part separately, and as the last would remain twelve years in saintfoin, they might be plowed up one two or three years before the end of that term.

After all, it is not incumbent on me to lay down every thing in so precise a manner; I must necessarily suppose the farmer to have some forecast and attention to his business, or it is vain for him to follow it.

4. If the land is divided into ten portions only, the wished for end will be sooner attained.

I would have the farmer take notice, that the working his land will be inconvenient to him, if the pieces which he is successively to sow, are not contiguous; when the work is laid out in this manner, it is done with great ease.

The farmer who would wish to insure to himself success in this method of husbandry, will also do well not to depend too much on those writers, who assert that they have had large crops of saintfoin on poor land, without dung, and almost without any previous tillage. I would much rather recommend it to him to bring his land into as fine a tilth as possible, to plow deep, to divide the particles of the soil by breaking the clods, to destroy all the weeds and grass, and finally, to give it a good dressing of such dung as he has carefully saved for several preceding years.

By this method of proceeding, the young plants of saintfoin will soon become vigorous and luxuriant enough, to defend themselves against the natural grass, and other weeds, which are commonly fatal

to their growth: having thus become vigorous, and having pushed their tap-root deep into the bosom of the earth, they will remain for a much longer time than they would otherwise do, in full perfection and bearing.

Having said so much on saintfoin, it will not at all be improper to resume the subject of clover, and point out the method in which the land is to be apportioned for the growth of this plant.

I have already observed, that clover is not to be neglected, if the farmer is possessed of a soil well adapted to its support and nourishment.

Divide then the land which you intend for clover, into five or six portions, by which means, you will allow three years for the growth of the plant, and two or three years for tillage, or the growth of corn after it is off the land. Lay down this scheme also on paper.

For my own particular part, I prefer dividing the land into six portions, because I by that means get a crop of corn the more, at the same expence, or at least with very little addition.

I would also recommend, that the land be well dressed with dung, for the crop of corn that is sown the year before the clover is to be sown, this is the common practice with the farmers in this part of the world, and I much approve of it, though in doing so, I differ in opinion from some writers on the subject of agriculture.

With respect to the time of sowing the clover-feed, I also conform to the ordinary practice of the country; that is to say, and indeed I ought before to have mentioned it, I strew the feed amongst the young corn the latter end of April, or the beginning of May.

But it may be asked, in what manner shall I contrive to continue this method of culture on my land?

I answer

I answer with regard to clover, that after it has yielded crops for two entire years, and been mown once about the end of May the year following, it should be immediately plowed, and after six, seven, or eight weeks, plowed a second time, and, lastly, it should get a good dressing of dung, and be plowed for sowing wheat, rye, or any other winter corn.

The following year let it be plowed immediately after harvest, and for the second crop sow turneps, &c. or wait till autumn and sow vetches, winter barley or bere; or in the spring sow barley, &c.

[It may be proper to observe, that in Switzerland their harvests are forwarder than ours, being got in in July, in which month our author would have the turneps sown.]

Immediately after the second crop is off the land, let it be again plowed, if you possibly can, let it have a second plowing in four or five weeks, give it afterwards a thorough good dressing of dung, and then sow it in the beginning of the month of October with the best wheat, that the clover seed may be sprinkled on it the following spring.

By this management, in the space of two years and four months, your land will have been plowed eight, or at the least seven times, it will have had two good dressings of dung, and though it will have yielded you three crops, rest assured it will be greatly improved.

Can any thing be more easy than for the farmer to continue this plan of husbandry in the manner I have laid down?

I must once more repeat, that the portions or parts, into which the land is to be divided, should be quite distinct and plain, and that the farmer should note down in writing, *in such a year such a portion or piece of clover is to be plowed up, and such another piece is to be sown in clover; every piece should be managed and husbanded in such and such a manner.* If
the

the farmer is careful to make this note, either on the paper in which he made the general allotment of his land, or in a seperate paper, he will be thereby enabled to carry on his business in a regular manner, without trouble or fatigue to himself, and if he cannot, I must pronounce him but one degree from a natural.

The same is to be said with respect to faintfoin, though the method is not quite the same, it is, nevertheless, as easily carried into execution.

I could, as I have recommended in the case of clover, turn up my faintfoin lays in June after having taken one cutting; but I rather chuse to treat them like worn out pastures, because towards the end of their term of duration, they have nearly as large a portion of grass on them as faintfoin.

Thus in the eighth year, for instance, if my faintfoin was sown in August 1755, I have it turned up in the autumn of 1763, with a good and strong plough, making the plowman go as deep as he can, and as the soil will allow.

In the spring following, after passing the drags over it, I sow it with oats, which I harrow in; and by the time the oats are off the ground, I find that the faintfoin roots are thoroughly rotted and consumed.

I generally have a large crop from these oats: after they are got in, I plow the land two, or if possible, three times, give it a good dressing of dung, and sow it with wheat; then, without ever letting my land lay fallow, managing in the same manner as I mentioned in treating of clover, I get two other crops successively.

Immediately after the last crop is off the land, I plow it, and in a month afterwards, or about the end of August, I plow it again for sowing faintfoin.

A few remarks in this place may not perhaps be deemed amiss.

1. If I lived in a colder climate, I should sow my saintfoin at the first plowing after harvest; for it is necessary that this plant should have acquired some degree of strength before the hard frosts come on.

2. Of these two plowings the last is to be shallowest, lest the stubble should be brought to the surface by the point of the share.

3. Some farmers, I am acquainted with, sow their saintfoin with the last crop of wheat, but I am as yet unacquainted with what success they have had; I shall, however, make the experiment, tho' I am inclined to think that this method will greatly encourage the growth of the natural grass.

But to return once more to the important part of my subject, the reader will perceive that I have, by this management, four successive crops of corn, the first of oats.

I will not pretend to say, that after these crops my land will be in heart good enough to sow on it Lucerne, or other plants, which require a very rich soil; but it will, however, be in condition good enough to sow it again with saintfoin.

What is there then in this plan of husbandry which can possibly be deemed impracticable, or even difficult, by the reflecting farmer?

The saintfoin which he sows in 1765 will be plowed up in 1773. In the spring of the year 1774 he sows the land with oats, the same autumn with wheat, or some other winter grain, he will then have two more crops, and in 1777 it will be again laid down in saintfoin.

When your land is brought into this order of culture, it is surely very easy to make a note, as I recommended in the case of clover, *Such a year I am to break up such a piece of saintfoin, and sow saintfoin on such other piece, &c.*

But after all, I am very sensible this question will not fail being asked: Is there any considerable profit

fit to be got by thus changing our methods of husbandry? That there is much to be got by it, I shall endeavour, if possible, to convince my reader.

CHAP. V.

Shews how much this Culture is superior to that generally practised.

I shall not take up the reader's time by estimating the gradual encrease of profit which will accrue to the farmer, from the first year when he takes up this culture, to the time when he practises it in its greatest latitude. I am not, at present, sufficiently at leisure to make this calculation, it will therefore be fully sufficient, if I lay down the advantage which may be reaped from this method of husbandry, when all the pieces are in full bearing, and compare it with what such land now produces; this comparison will lead me to the point at which I wish to arrive.

In making this comparison, I except, as I have already observed, all meadow land or rich pastures.

In order to bring this matter more fully within the reader's view, I shall suppose this husbandry practised on a farm of sixty acres, and after allowing a reasonable and proper sum for the value of the produce of this farm one year with another, I shall try if more might not be made of the same land, by adopting my plan of husbandry, and planting it with clover; I shall then examine what superior advantages result from adopting my plan in relation to saintfoin.

I must suppose the soil of this farm to be of a moderate quality, capable of affording nourishment, with good management, to a crop of clover,

It would be very difficult to ascertain the value of the several parts of the annual produce of this farm, and to allow for all the articles of expence which are of course to be deducted from the clear gain, or from what is to maintain the farmer and his immediate family; I shall therefore go a shorter way to work, and suppose the rent of this farm to be thirty pounds a year, that is ten shillings an acre, and I will suppose also, that when wheat is nine pounds per load, that the farmer makes three rents of the gross produce of his land, one of which is to go to the landlord, the second to pay the expences of husbandry, parish rates, and other incidental matters, and the third to go to the support of his family.

These suppositions will, I suppose, very readily be allowed, as the profit of farming, in the old way, is generally estimated at what I have mentioned, or nearly so at least.

We may now stop a-while, and see how the account will stand in this common way of husbandry; it will doubtless be as follows:

Three rents of fixty acres, at 10 s. per	l.	s.	d.
acre, amounts to		90	0 0

From which deduct

For the landlord one rent

30 l.

For defraying the expences of culture, manure, black-smith, plow-wright, parish taxes, tythes, and other incidental charges, a second rent

30 l.

60 l.

60 0 0

Remains to pay the farmer for his trouble & maintain his family, the third rent, namely

30 0 0

Let

Let us now see what this land would produce, supposing it to be cultivated after my manner with clover, in different portions or allotments, and supposing the plan of husbandry to be fully perfected.

These sixty acres of land will be divided into six equal portions, of ten acres each; of which portions there will every year be two in full bearing of wheat.

Suppose these two portions, or twenty acres of wheat, to yield, one with another, a crop of twenty bushels per acre, and that wheat is at nine pounds per load; on this supposition, which is far from being unreasonable, the whole crop will amount to four hundred bushels, or fifty quarters, or ten loads, which at the above prices comes to	l. s. d. 90 0 0
--	--

Though turnips, winter barley, maslin, or the several sorts of spring corn, which may be sown as a second crop, yield a good encrease, yet there will be only one portion of land allowed for whichever of them is sown; we will suppose it Barley, and that the ten acres produce forty quarters, this cannot be estimated too high, if we say it will fetch	30 0 0
---	--------

Two other portions, of ten acres each, will have on them full crops of clover; as this may be cut twice within the year (in England we mean) it cannot be thought much if we estimate the crop of the 20 acres, one with another, at two loads an acre, which at 20s. per load amounts to	40 0 0
---	--------

Let

There will be clover on two other portions, that is to say, the first cutting of the portion which is to be plowed up and what will have grown on the piece sown that year; but as the last will seldom (in England) be worth mowing, we shall reckon only the first at one load per acre, which at the price abovementioned comes to

l. s. d.

IO O O

In the above estimates I might reckon the value of many other articles, as of straw, rouens, the feed of ten acres of clover for the first autumn after it is sown, &c. however, as some may imagine I have already estimated the first mentioned articles too high, which in truth I have not, I shall set down for them

○○○

The sum total then of the whole of one year's produce of this farm cultivated after my method will be

170 0 0

From this take the supposed produce in
the method named three rents

90 0 0

And there will remain a difference of

80 0 0

I know it will be urged, that I have estimated the crops of corn too high, not in price but in quantity; but in answer to this I say, that land cultivated, after my method, will be richer in quality than what is managed in the ordinary way, for a considerable quantity of this fodder, will, and must of course, be spent on the farm; this will produce a large quantity of dung, so that the farmer will never want manure wherewith to dress his land, and his crops, both of corn and clover, will be in proportion encreased.

My

My method may, on account of the frequent plowings, be somewhat more expensive than the old negligent way ; but when we consider the profits, it must surely be allowed, that after all deductions that can be with reason made, there will still remain a large balance in my favour.

When I say my method may be more expensive than the old way, I mean as far as relates to the land that is immediately under the plow, which will every year amount in quantity to about thirty acres, or three portions ; yet suppose (which is indeed an unreasonable supposition) that the tillage of this quantity should, in the method I recommend, cost double what the same number of acres would in the ordinary way, yet would not my expence in tillage, taking the whole farm together, exceed that incurred in the last mentioned method ; because, it must be observed, that in the old husbandry, the whole sixty acres are annually plowed, whereas, in mine, only half the number of acres are in immediate tillage.

The intelligent farmer will easily see and comprehend the manner in which I have stated this account, let him alter it according to the quality and produce of his own land, and he will still find it greatly for his advantage to adopt, in all its parts, the plan of husbandry which I, warranted by the many years experience I have had, so strenuously recommend.

It cannot be urged that I have exaggerated in this account, as twenty bushels of wheat on an acre cannot be esteemed more than a middling crop on tolerable land, that has been well plowed and well dressed with good manure in a proper quantity ; farmers have very often forty bushels, and nothing is more common, near large towns, than from thirty-two to thirty-six bushels of wheat per acre, throughout a large field, or perhaps a considerable farm.

As

As to the price, wheat has not been much lower (in England) for some years, higher it has been often.

A man must indeed be greatly prejudiced against innovations not to be tempted by this prospect of so considerable an encrease of profit; and the more so as the experiment, as far as relates to clover, may, though with evident disadvantages, be tried on so small a quantity of land as six acres, and it is pretty plain, no loss can possibly come to the farmer who ventures to quit the old beaten track.

Let us now take a view of the produce of this farm of sixty acres when husbanded after the manner recommended by me in full bearing with Saintfoin.

When Saintfoin is the more immediate object, the sixty acres must be divided into twelve portions or parts, each containing five acres.

There will be two portions, or ten acres	l. s. d.
in wheat, which I will estimate at half	
what I allowed under the article clover,	
that is to say	45 0 0
Secondly, there will be one portion under	
a third crop, which we may fairly value at	20 0 0
There will thirdly be one other portion of	
five acres in oats, and as this crop is ge-	
nerally considerable, we shall value it	
very low if we assign for it only the same	
sum as for the last article, namely	20 0 0
Fourthly, there will be eight portions, or	
forty acres, in full bearing, under saint-	
foin, if we estimate the crop of these	
forty acres at sixty loads, it must be	
allowed a very moderate calculation,	
and if we assign the same value to this	
as we did to clover, the amount of the	
whole will be	60 0 0

Thus

Thus the sum total of the produce of the	l.	s.	d.
farm, when cultivated in my way, and			
under faintfoin, will be, according to			
the above calculation	145	0	0

Though the sum total is here less than it was under the head of clover, as above calculated, it is necessary to observe :

First, that this crop is less subject to accidents than clover, therefore more to be depended on. Clover is greatly hurt by a dry summer, whilst faintfoin, which also hays much the best, scarcely feels it.

Secondly, the crops of corn that follow faintfoin, though I have estimated them no higher, are, when all other circumstances are alike, considerably larger than those which follow clover.

Thirdly, when the farm cultivated after my manner is under faintfoin, there will be much more fodder, and of course more dung than can be used, therefore the farmer will have an opportunity of turning a much larger part of his crop into ready money, by sending it to market, but if he has not a ready sale at a proper price for his faintfoin, let him divide his land into ten portions only of six acres each, as he will then have more corn and less fodder, which will be in such circumstances most to his advantage.

Fourthly, when the land in faintfoin is divided into twelve portions, the expence of tillage is less by almost one half than in the case of clover, there being twenty instead of thirty acres under the plough.

However, after all my experience in the matter, I cannot form any judgment on it relative to the comparative profits, except that I have nearly found them equal, and never prefer one to the other, but according to particulary circumstances.

I have, indeed, on my estate, two several divisions or apportionments, one for clover and the other for faintfoin

saintfoin, but my principal reason for it is, that I find clover more convenient for me to be given green to my cattle, and that it yields better crops in certain parts of my land than saintfoin would do.

I would now fain ask, admitting the exactitude of my calculation, and the truth of the facts on which it is founded, facts universally known in all the neighbourhood where I live, I say I would fain ask, whether I have not the greatest reason in the world to blame my countrymen, who live under the mildest of governments, for not practising this method of husbandry, particularly when they are morally sure that no exciseman will come to snatch from them the fruits of their industry.

Such a considerable increase in the actual produce of lands, is certainly well worth attention, it is improving estates, without adding to their extent, and is undoubtedly much better than purchasing any addition to the badly cultivated land a person may be already possessed of.

I seem in imagination, to see this husbandry universally adopted, and in the same perspective, I seem to see the honest husbandman raising a larger profit for the benefit of his family, at the expence of less labour, fatigue, and sweat, I see him better fed, better clad, more healthy, robust, and perhaps less vicious. Those half starved lean cattle, with which the poor hind now half plows his land, and thereby half ruins himself, seem to vanish from my sight, and in their stead, I see our stables and ox-stalls filled with large and noble cattle, in good condition; I see neat habitations dispersed over the face of the country. The proprietor of land, the farmer, and the handicraftsman, all partake of the benefits resulting from this encreased produce. The public revenues, as well as the rents of particulars, are better paid, the value of land rises together with the rents; in a word, every part of the country feels the
the

the benefit of this improvement, agriculture and trade flourish, and all things are rendered by it in a condition far more prosperous.

Neither is this a picture formed merely by the strength of imagination, and which can never be realized; I have given sufficient proofs to the contrary, and if it should be thought any ways necessary, in order entirely to convince my readers, to obviate the principal objections which may be formed to the plan of husbandry I here so strongly recommend, I shall very willingly do it in a separate chapter, which shall conclude the present treatise.

CHAPTER VI.

The principal Objections, which may be formed to this Plan of Husbandry, answered.

It is a disorder incident to human nature, to disdain being instructed by an equal. Scarcely indeed do we brook with it from our superiors.

Farmers are not free from this disorder, vanity and envy often cause them to neglect their true interests, rather than reap any benefit from the instructions and examples of their neighbours, as that would be acknowledging a superiority in one respect at least.

I must therefore naturally, and in course, expect that many people will reject this plan of husbandry, without ever having sufficiently examined it, or even comprehending the extent of its meaning.

Let such do as they please, let them form objections, and cast what difficulties they can in my way, it is but fighting with the air. It is no ways necessary for me to give myself uneasiness on this account, neither is it at all incumbent on me to suggest an-

swers to such objectors, before they have made their attack.

But other well meaning readers may start at some objections, specious at least, which seem to offer themselves, and may imagine that my whole plan is likely to be overfet by them; such we must, if it is possible, satisfy.

It may be objected, that if so large a proportion of our land was converted to cultivating grasses, bread corn would become scarcer, and of course dearer, an objector might probably say to me, “ You propose here a plan of improvement, which appears to be very advantageous to the farmer, but would it be equally so to the other classes of the people? What a considerable quantity of land would in your method be taken from the plow? Of course, if your plan is fully carried into execution, it must necessarily enhance the price of bread corn, that principal requisite, that absolute necessary of life, or it might by lessening the quantity of corn raised, occasion our wanting a supply from abroad, and then our neighbours might either supply us at their own price, or refuse to do it, which ever they thought proper.”

This is the strongest and most specious objection that can be formed to my plan, yet may it with the greatest ease be answered.

In answer to it, I must in the first place observe, that the farmers and husbandmen are certainly the principal strength of the state, and of course this class of people ought to be at least as much encouraged as others, if not more. Why should these men labour hard for a small profit, when handicraftsmen who are never exposed to the injuries of the weather, and whose work is done with much less waste of strength, are by far better paid?

Secondly, every farmer has certainly a right to follow that mode of culture which is most advantageous

tageous to him; when corn sells well, you may depend upon it he will endeavour to grow as much of it as he can.

Thirdly, as this plan of culture will of course encrease the number of our black cattle, butcher's meat will be in much greater plenty, and cheaper, and this cannot but influence the price of bread; we may then without murmuring, allow for a large exportation of wheat, as when butcher's meat is brought in greater plenty to the market, bread will not be the only food of the poor, and will also be considerably cheaper.

Fourthly, to give a still more satisfactory and immediate answer to this objection, I deny that there will be less wheat grown when this plan of culture is properly carried into execution: on the contrary, I aver there will be more.

When clover is the object of this culture, a third part of the land will be under winter corn, which is the same quantity as in the old husbandry; the other portions will supply you with a considerable quantity of manure, to dress these two portions; to this we may add, the meadow land on the farm, which I have not included in my plan, and the quantity of manure you will possess, will be almost doubled: if you plow in an unhusband-like manner, I acknowledge that this encrease of manure, will only be a means of your having a larger quantity of straw, but if you plow deep, and keep your land in good tilth, you may save a great deal of seed, and not only have more straw, but double the quantity of corn. Thus last year I had four quarters of wheat an acre, whilst my neighbours had scarcely four comb an acre of wheat, much inferior to mine in quality.

Fifthly, when saintfoin is cultivated according to my plan, only half the quantity of land now sown with corn, will be under wheat, (if the land is di-

vided into ten portions two thirds) but if these two thirds, or this half, will produce as much corn, the saving in seed will be all clear profit; the same may be said of spring corn.

Sixthly, as we shall have more dung, all those lands which now lay waste, may be brought into tillage.

Seventhly, we need say nothing more in recommendation of this plan, than that corn is cheapest and in the greatest plenty, in all those counties of England which have adopted the culture of clover and saintfoin.

It cannot then but be acknowledged, that the apprehension of corn becoming scarcer or dearer by the adoption of this plan of culture, is indeed very badly founded.

Let us next examine whether the obstacles which this plan may meet with when it comes to be carried into execution, may not with as much ease be removed.

I know it will be objected, that the expence of enclosing, will be too great to be born by common farmers; it will doubtless be said, that "the practice of this method of culture cannot be generally adopted. What an expence must it be to enclose the sixty acres above-mentioned, or any other quantity of land to be brought under this course of tillage, the procuring an act of state, digging ditches, planting quickset hedges, keeping up the fences, all this must require at least a double capital, which few private people can afford to advance."

To all this I answer, that whoever ventures to make these disbursements, will find himself in the end amply repaid by the many advantages which will accrue to him. Were the expence much greater than they really are, they would still bear no proportion to the benefits resulting from the practice of
my

my plan. As to the procuring an act of state, I acknowledge that to be attended with some difficulty, as well as expence, but I hope it will not be long before this obstacle is entirely removed, and that a general act of enclosure may be passed, empowering every land owner to appropriate to his own immediate and particular use, the land which now lays in common, by enclosing it, provided it is with quick hedges, and that oak trees are planted for timber, at certain distances. This will not only supply the decay of timber, which has so long with great reason been complained of, but will also be a shelter to the corn from blighting winds, and will make our crops much more certain and regular, than they now are.

Great objections have been formed against the enclosing of common lands, and plowing up sheep walks ; it has been even said, that if such a plan of husbandry was pursued, our breed of sheep would by degrees dwindle and be lost, our annual stock of wool greatly decrease, and that valuable branch of trade, the woollen manufactory, be transferred to some other nation. But the case has turned out quite contrary, for though in England so much more land has been brought into tillage, than was before under the plow, yet wool is so plentiful, that many hundred tons are annually smuggled into France, without raising the price of it in any considerable degree. The reason is plain; when the same quantity of land produces larger crops, as it does undoubtedly by my method, it must necessarily be capable of supporting a greater number of stock.

For these reasons, I hope, that not only an act may pass to permit every one to enclose his own land, as I have already observed, but I also hope it will contain a clause to compel every one to do it within a limited time, for the benefit of the community

munity in general; I am sensible many will exclaim against this doctrine, alledging that it is not consistent with the liberty we enjoy, but this is saying nothing, to indulge our own humours, when it is hurtful to the nation, cannot be called liberty, and there surely can be no great harm in obliging a man to do himself a service, especially when it happens as in this case, it does to coincide with the public good.

But another objector still continuing the argument, will perhaps say, "You cannot certainly mean that all the small plots, acre and half acre lands, should be enclosed, such as are seen dispersed over all the common field land, your intention, doubtless, must be that they alone should have the liberty of enclosing, who possess pieces of a tolerable size, as five or six acres and upwards, of course what a number of exchanges must there be, and what confusion and disputes will arise, besides the expence of writings to be drawn, wherever any exchanges of land are made."

I acknowledge the truth of this, excepting that I would have enclosing general, but it must at the same time be admitted, that as much the greatest part of our landowners are proprietors of considerable tracks of the common field uninclosed land, exchanges might easily be made, and at no great expence, or as in many cases is usual, the whole of the land might be allotted, and a jury of impartial and disinterested men might assign every one his proper portion. This might easily be done, and it is well known that when land is thus enclosed, the rent is immediately doubled, and it becomes of three times the value to sell. In some counties where the gavel kind takes place, these enclosed pieces might, it is true, again be divided, but marriages or inheritance might also again unite them; pieces might also be procured by purchase, and when it was once
known

known that to cultivate land to advantage, the fields must be of a moderate size, this would in some sort prevent these subdivisions.

The best cultivated lands are let at the highest rents, and improved estates are also doubtless of the greatest value, this then should induce the proprietors of land to have some attention to their own interest, which cannot be more effectually promoted than by the adoption of the plan of husbandry, which in this treatise I have so strenuously recommended.

I have now, I think, answered the principal difficulties which can be objected to my plan; these have all been mentioned to me by different people whom I have consulted on the subject, as to other more insignificant objections which either do not occur to me, or which merit not my attention, I leave them to such as may have more leisure to consider them, and that I may not lose that merit which consists in brevity, I shall in this place bid adieu to the candid reader.



ARTICLE XLI.

An Account of the Method in which the estate of Aspi near Aarberg in Switzerland, was improved, written by Mr. TSCHIFFELI.

ALL husbandmen know the truth of this maxim, that a great plenty of fodder is the mother of agriculture. It is requisite there should be a certain quantity of grass land to every farm. It will then seem surprizing that a peasant far from being rich, should be able to cultivate to advantage, a
parcel

parcel of land that was all in tillage, yet experience tells us this has been done. This example we think proper to be laid before other farmers, that they may be induced to follow it.

In the year 1743, their excellencies thought proper to sell the greatest part of the land that was dependant on the castle of Aarberg; the estate of Aspi amongst others, was sold. It consisted of about sixty acres in tillage, divided into three portions, a very indifferent barn, and a right of commonage on a large marshy tract. Such as knew the estate well, knew how small the crops on it were.

Every one therefore was astonished that Nicolas Walti, father to the present proprietors, who was but in very indifferent circumstances, should buy this estate at so large a price as 15,000 livres of Berne; they imagined he and his whole family, would in a few years be ruined, and the sooner as there was no spring of water on the estate, nor any means of watering it.

Walti had two principal reasons for buying this estate. He at that time held a farm about two leagues from Aspi, and he hoped he should be able to cultivate both farms with the same stock, ploughs, horses, &c.

He was also in hopes that the soil of Aspi would be proper for laying down in grass, which, however, he did not in the end find to be the case.

He at that time knew nothing of the soil called in Switzerland, *Ey-Grund*, of which the surface of the estate of Aspi entirely consisted. This is a bad kind of a clay.

He thought from the appearance of the land, that after it had been suffered to rest a little, it would produce good pasture.

The truth is, that they who are not thoroughly well acquainted with this mild and light brown earth, which

which when once it is broke up, is with great difficulty brought to bear a turf again, may easily be deceived by it.

In order to be perfectly well acquainted with it, it is necessary to observe, that in rainy weather it becomes very clammy, and in dry weather it is very apt to cleave, insomuch that there will be deep cracks in it.

Of this soil, the whole surface of the estate of Aspi consists; under it, at various depths, from six inches to three feet, is a kind of earth, originally white and wet, but much mixed with sand, and, according to all appearance, entirely barren.

Walti soon found, that if he did not take some new measures with his late purchased land, he would be speedily and infallibly ruined.

The land at Aspi produced only a very scanty feed for his cattle, and he found, when too late, that his farm was at too great a distance for him to cultivate both with the same horses, unless he put himself to great inconveniences, and incurred very large expences. He came therefore to a resolution of quitting his farm, and of using his own and his sons best endeavours to bring the land of Aspi into good condition, and to try whether saintfoin, now well known in all parts, but at that time very little cultivated in Switzerland, except in the country of Vaud, and the district of Neufchatel, would succeed on his land.

He made his first experiment in 1747 with about half a bushel of the seed, and to this small trial are we to attribute the present flourishing condition of the estate of Aspi, and the ease and affluence of its proprietors. These last now pay five times as much tythe as did their late father. They grow every year a very considerable quantity of winter grain, and have saintfoin hay enough to winter from twenty to twenty-five colts, buds, or oxen, to say nothing of their spring corn, and a great quantity of green

fodder that is consumed in the spring, summer, and autumn, by their stock. In fact, these two brothers, the Walti, by the blessing of God, and their industry, are the richest people in the neighbourhood, and their wealth is every year encreasing.

As we have remarked that the present flourishing condition of the estate of Aspi, and the wealth of its owners, is wholly to be attributed to their cultivating saintfoin, and as every farmer who holds enclosed land that is not either too strong nor too wet, may follow their example; it cannot fail being beneficial to all husbandmen, if we relate in a plain intelligible manner, the method in which the two brothers Walti managed in order to crop their lands with this useful grass.

After having plowed and manured a piece of land for sowing on it Bere or square Barley, they plow it immediately after the Bere is harvested, and then harrow it and cross harrow it with a pair of very heavy wooden drags; they then sow on it saintfoin after the rate of nine bushels to an acre, and again harrow and cross harrow the land.

They then leave the land after it has been thus sown in the month of August till the following spring, without troubling themselves whether the weeds come up with the saintfoin or not.

They know by experience that their land is not well adapted to the growth of natural grass, and that the saintfoin will choak up all the weeds the second year.

They mow this saintfoin for the first time about Midsummer following, and it will afterwards grow strong enough to afford good feed for young cattle; I say young cattle, because the land not being sufficiently settled the first year, the owners take care not to turn on it full grown cattle, as they would by their weight poach the land, and do great damage to the saintfoin: at the end of two years, however, the

the land being better settled, they drive on their great cattle, and have not found any damage to ensue to the faintfoin, provided they take care only to turn them on in dry weather, and do not suffer it to be eaten down too close.

When the faintfoin is mown, they leave it in the field to dry as much as possible, particularly that which they intend for the use of their horses, and when they get it in, they follow the ordinary method practised with common hay, excepting that they never cock it, loading it from the swarth. By this means they lose fewer leaves, and less of it is scattered.

If any rain falls on the faintfoin, so as to wet it whilst the hay is making, they leave it in the field, without stirring, till it is thoroughly dry, for if they were to cock it like common hay, it would heat, turn black, and be of no use.

The owners of the estate of Aspi, have, at this time, such plenty of faintfoin, that they not only every year save a sufficient quantity of seed for their own use, but in favourable seasons have a great deal to spare to sell to their neighbours, for which they get a good price.

When they mean to save the seed of faintfoin, they leave it standing till the seed is perfectly ripe; but that which they intend for the use of cattle, they cut when the plant is in blossom.

That the seed may have the more time to attain its perfect maturity, they save it from the first cutting, and never from the second. It is cut when rye harvest begins in the following manner.

They mow faintfoin, when it has stood for seed, nearly in the same manner as in some countries they mow wheat, that is to say with a common scythe, but then they take only half strokes, and are particularly careful that the crop end of the faintfoin should always fall on the tail of that cut before: they then

leave in the field, till noon, the faintfoin that was cut at the break of day. At noon they make use of forks to lay the faintfoin in swarth, beginning where they left off mowing, in the same manner as is done with the hands in wheat harvest, when the crop is mown.

If the day is very hot, the faintfoin is left to dry from noon to night, at which time they, with great care, get it into heaps. They then load it with a fork into a waggon lined with a coarse cloth, taking care that the crop ends are inward.

If the day has not been hot enough, the faintfoin is very carefully turned with small poles, and it is not carted in till the next day after the dew is off the land.

In order to execute this work properly, it will be necessary to have careful people, or a great part of the seed will drop on the land.

When the faintfoin is got into the barn, it is spread very thick on the floor, when one or two threshers pass the flail lightly over it, turn it, and thresh it once more.

When the seed is threshed out, the hay or straw that is left is rather of the coarsest; however, horses which have no great matter of work to do will eat it in the winter, but it must not be given to horned cattle, as it would set their teeth an edge, and spoil them.

When the seed is threshed out, it should be spread very thin on an airy floor for three weeks or a month, stirring it at least once a day with a rake, or it will be apt to heat, and then it will not grow. It may at the end of that time be laid in a round heap about eighteen inches high, observing, however, to stir it every day for some time with a shovel.

The two brothers Walti have observed, after a long experience, that faintfoin will preserve its vigour and growth in their land from ten to fifteen years, without

without dung, or any other amendment. The deeper their clay is, the better does the faintfoin thrive. The greatest vigour of the plant is with them from the third to the eighth year. They have annually two large crops, but the first is always most considerable; however, it is only where the clay is deep that they have two crops annually, for where it is shallow they are content with feeding it after the first crop is off, and the plant begins to shoot again.

Green faintfoin is excellent fodder, and makes cows give a large quantity of milk; as to the faintfoin that is dried for hay, the proprietors of Aspi have observed that the second crop is better for cows than the first, and the same is to be said of common hay.

If the bere sown on the land intended for faintfoin happens to be thin in spring, they do not wait till harvest before they sow their faintfoin, but sow it amongst the bere about the time that rye begins to spindle, harrowing in the seed with a light wooden harrow.

One advantage they derive from this practice, which is, that they can turn young cattle in to graze it the first year.

They have also another method of sowing faintfoin.

They plow before the winter, very slightly however, some land that has been under wheat, scarcely doing any thing more than turning up the stubble. In the spring they harrow up the stubble, and plow the land in the ordinary method.

As soon as a mild rain comes on, they harrow the field, and sow it with spring barley, and immediately afterwards with faintfoin, plowing them both in with a light furrow.

Lastly, they sometimes sow faintfoin in the spring alone as soon as the hard frosts are over, and they have hitherto found no difference betwixt these two last methods.

They

They have plowed up several fields where the saint-foin began to fall off, and after two or three plowings, they have sown them with winter corn. They find by experience, that the corn is finer in these fields than in those which had never been sown with saintfoin, which is an evident proof, that this plant rather improves than impoverishes land.

I received this account from Nicolas Walti, one of the proprietors of the estate of Aspi.

The amazing improvements of these lands is well known to all the inhabitants of the Bailiwick of Aarberg, and this remarkable example of success, has greatly contributed to the establishment of saintfoin in all that part of the country.



ARTICLE XLII.

An Essay on the means of preventing the Smut in Corn, written by Mr. B. HERCULES SPRUNGLI of Lipperswyl, in Thourgovia, Switzerland.

IN an Essay on the smut in corn, inserted in the *Nouvelles Economiques*, published in Germany, the author recommends a remedy against this distemper. It consists of a mixture of rain water, quick lime, foot, and common salt.

In the 1754 a third part of my wheat was smutty. The Lixivium, abovementioned, preserved me from it the following year, the short backward ears only being infected.

If I mistake not, Richard and Leopold advise farmers to sow only wheat of more than one year old.

In my experiments, I united these two precautions.

My experiments, which have been continued only a few years, are not of sufficient authority to decide in

in this matter. The authors abovementioned, attribute the smut in corn to the want of ripeness in the seed.

I endeavoured to benefit by their advice. For four years past our oats have ripened very unequally; we have, besides, within that time, had a fourth, a third, and sometimes even three fourths of our oats smutty. Spring barley, which is apt to ripen very unequally in our part of the world, is also frequently smutty.

Can this lixivium supply the want of ripeness, by giving the seed a greater vegetative power, or do the unripe seeds become totally sterile after they have been kept a few years?

I have endeavoured of late years to steep oats and barley in the lixivium, but it had not quite the wished for effect; however, I suffered then less from the smut than my neighbours.

As my seed was thoroughly ripe, perhaps the lixivium was too weak, and could not penetrate the tough outward skin, or, perhaps, I did not leave the seed long enough steeping in the lixivium. But these omissions may easily be remedied by others, who may adopt this method of preserving their crops from smut.



ARTICLE XLIII.

Account of a Lixivium, which the Farmers of the Country of Nidau, in Switzerland, make use of, to prevent their Corn from being smutty; written by Mr. N. E. TSCHARNER, Secretary to the Œconomical Society of Berne.

IN the country of Nidau, where they grow a great deal of good corn, Bere or square Barley in particular, is very much subject to be smutty.

A farmer of Moesiguen boasted he had a secret of preserving corn from that distemper, and, in fact, his assertion was proved to be true, by his crops being more free from it than those of his neighbours.

He made use of a lixivium to wash and prepare his seed before it was sown.

Not having time to assist all those who applied to him, he came to a resolution of selling the receipt to his neighbours, one of whom was disinterested enough to make it public.

The more this method of preparing the seed corn was known and tried, the more credit it acquired, and at this time no farmer in that neighbourhood is lazy enough to grudge the trouble of preparing his seed in this manner, or covetous enough to hesitate at the expence of the operation.

A wealthy and intelligent farmer communicated the receipt to me, assuring me at the same time, that for ten years passed, which he has used it, his corn has been entirely free from the smut, without even excepting last year, when the smut made such havock amongst the wheat and bere.

To

To twenty gallons of water put about half a bushel of quick lime, half a pound of soap, and the same quantity of saltpetre. These two last ingredients may be saved, if the draining of the farmer's yard is used instead of plain water. These twenty gallons of water should be boiled till the lime is entirely dissolved in it.

The farmer begins to prepare his seed when the lixivium is almost cold. He first puts half a bushel of seed into a tub, on which he sprinkles with his hand to the quantity of two quarts of the mixture, keeping the corn stirring all the time with a stick.

He then throws in another half bushel, which he in like manner sprinkles with the mixture, stirring at the same time the whole mass well. He continues this work till the tub is near full, using about two quarts of the lixivium to half a bushel of corn.

He then covers the tub with a coarse cloth, and leaves it for eight and forty hours to dry, only he must stir the corn twice in that time to forward the evaporation of the superfluous moisture, and to spread the dust of the lime in all parts alike.

It is to be remarked, that in this operation the corn encreases in bulk one sixth part, of course, where five bushels of unprepared seed would be sown, six must be used.

The farmer, who furnished me with this account, says, that he always prefers using this lixivium milk warm, and that of all drainings of yards, he likes that best which comes from horses and hogs, which may occasionally be mixed with the muddy water of bogs or ponds.



ARTICLE XLIV.

A Description of the Hay Harvest in the Environs of Bourgestein in Switzerland. Written by Mr. DE G. DE B Member of the Berne Society.

WHILST others are employed this fine weather in getting in their hay, which is now arrived at its most perfect state, I shall fill up a little leisure time in describing the travels of the honest husbandman, when employed in his hay harvest, and getting together a sufficient quantity of fodder to serve his cattle during the long winter months.

Before the sun has gilded the summits of the high mountains, the careful husbandman awaking steals from the arms of his beloved wife; he takes his scythe, calls to him the companions of his labour, and betakes himself to the meadows, yet covered with dew. The moistened grass falls beneath his feet at every step he takes, not a flower is spared, and the earth is scarcely permitted to reserve to itself the roots.

The creeping plants, the slender but tall stalks, the trefoil already ripe, and the cummin which serves instead of spice to the farmer, are cut down and speedily dried. He contemplates this image of the uncertainty of human life, yet still advances with equal step. In this manner a true philosopher considers with a tranquil eye the common incidents of life.

When the workmen have mown a considerable part of the meadow, the mistress brings them a repast, which she has with her own hands prepared. Sometimes it consists of milk pottage, at others of boiled pulse, on which alone they make a hearty meal.

They

They sit down on the grass, and chearfully enjoy these simple viands. The most delicious banquet does not so well satisfy him who has vitiated his taste, as this frugal repast seasoned and made savoury by labour.

The master takes no great respite, he whets his scythe, and again goes on with his work. His companions follow him in the same line, raise their scythes, and the grass once more falls beneath the blade. The best disciplined troops, which use their arms for the destruction of their fellow creatures, observe not more order, or follow their commander with greater obedience.

The women, one being allowed to two mowers, spread the swarths with forks. As soon as the sun has dispersed the dew, they scatter on the turf the half made hay, which had the day before been got into cocks, in order to preserve it during the night from being injured by rains or dew. The young children, playing about their mothers, accustom themselves betimes to lend her some assistance; but being speedily tired, they lay down on the ground which they are one day to cultivate, and in this manner inure their tender limbs to bear the sun's heat.

Towards noon, every one having mown his acre, carries home his scythe and sharpens it against the next morning, though sometimes this work is delayed till evening.

The master frequently watches the clouds, that he may thereby judge of the weather. He then calls his companions, and each man taking a rake, they hasten to turn the hay, which they had the day before mown, after which they turn that which was growing in the morning.

When this is done, they range themselves in couples, and working back to back, gather the hay in rows, and afterwards make it into small cocks.

Two men do this with forks, whilst the women carefully

fully rake up the hay which the men had left. In the mean time, the master arrives with his waggon, drawn by stout horses. Observe him carefully, and you will see him with the strength of a Sampson, take up with his fork entire cocks, and hand them to the man who artfully loads the waggon. It is now raised above the fore ladder of the carriage, when giving him a strong pole or lever, he binds the hay tight with a thick rope.

This load, high and unsteady, is accompanied by two stout men, who support it in rugged ways.

In the flat meadows, they draw the waggons into the barn, and unload the hay where it is to lie, spreading it equally, and treading it down, that it may the better preserve its fine smell. In this manner are the enamelled meadows despoiled of their beauty.

In the sloping mountain pastures, they make use of sledges, on which they carry every cock towards the barn; this work requires as much care and industry, as the ant employs to secure his little provinder.

The wise husbandman takes care to build his barn at the foot of the hill, so that he can bring the sledge quite into it, and unload it in a short space of time.

There also for the saving of time, art has invented another method. As the meadows have in some places too much slope, to admit of the use of a waggon, a single horse draws his load on a sledge, and hastes to get rid of it.

A stranger travelling that way, would be surprized at hearing a noise like thunder. He looks around him and perceives no sign of a tempest. His curiosity prompts him to approach the barn whence the noise proceeds, the floor is laid on the ground, and yet he sees the hay fly with great quickness through the air. Uncertain whether he can believe his eyesight,

sight, he observes the operation with great attention. He perceives a cord fast tied to a pully, without knowing for what use it is intended.

Soon after, another sledge with a like load arrives. He then sees that they empty it into a kind of net, and that the hay is drawn up from the sledge. Under the roof, stands a man like a centinel, he receives the load, and throws it to the place where it is to remain. Scarcely had he got hold of it, but he gives a signal by a cry, to the man who strongly held one end of the rope by the sledge upon which he is seated, and from which he had drawn up the load; this last lets go the rope, and nimbly jumps out of the sledge.

The empty net is again let down, and is ready to be once more filled. The beholder can scarcely believe his eyes, and ponders in what manner he can best imitate an art which appears to be so useful.

Let us next cast our eyes on that marshy plain where man is obliged himself to do the work for which he keeps his cattle. Neither the horse for which this fodder is got in, nor any assistance of art can ease the husbandman of this labour.

Several workmen form themselves in a row, and in couples carry a truss of hay on two poles, which would sooner break than slip from the hands of the robust bearers. When they have got halfway, they meet with another couple who ease them of their load, and carry it to a low barn. They know that men are under an obligation to assist their brethren in their common labours. Happy villagers! What advantage would it be to the more polished inhabitants of the world, were they to practise this duty, which they too frequently neglect. You alone faithfully bring into practice this admirable precept, with the excellence of which you are so well acquainted.

The hay is then left in the low barn, till the ice and snow have made the ground hard enough to bear

bear the horses, so that they may bring it into the loft. The provident husbandman is not yet tired, but gets home his hay at a season when the inhabitants of the towns dare scarcely stir out of their houses.

The hay of low marshy meadows, is generally given to horses. It is got in when the weather is fine, and the same day it is mown, for it dries much faster than that of dry meadows. Rain also spoils it much sooner than the fine upland hay, which is given to the cows.

This last, may in like manner, be got in the same day it is cut, provided it happens to be quite dry, and that much of it is not laid together, but it will soon spoil in the barn if it is not very dry.

More care still must be taken of the Rowen hay, which scarcely ever dries the same day, let the weather be ever so hot. That which dries fastest, and is soonest got in, is generally reckoned the best.

The author of the *Maison Rustique*, says that in England they assert, it is better to let the cut grass lay several days without spreading, and that then it should be dried in order to its being carted. Our method however, appears to me to be much the best, because grass preserves its smell and taste more when it is speedily dried. I have remarked, that the hay which has for several days laid on the land has scarcely had any smell, whilst that which has been quickly got in, has had a most delicious odour.

The naked eye can scarcely distinguish the solitary labourer who is walking on those heights, and who, without assistance, lays down his load on a large cloth. The slope of the mountain which will soon incommode him, now assists him in taking up his burthen; he continues his way in a stooping posture, but his firm foot carries him safely over the rugged hill. He fearless advances through steep paths

paths towards his cabbin, which is more distant from the valley, than from the clouds. But he is at the same time as much out of the reach of those numberless passions which agitate men here below, as his cabbin is placed above their habitations.

When he beholds the herd of cattle that is to support him during the winter, he flatters himself with the pleasing hope that he shall have wherewithall to subsist, when the mountains covered with snow will have cut off from him all communication with his fellow creatures.

May you long enjoy the fruits of your labours with a contented mind! you will be strong and hearty at an age when the citizen debilitated by too much ease, will regrettingly have left his long loved treasure to his griping heirs!

It frequently happens, that a single man will pass the winter in these mountains, with some cows, in a little cabbin, which cannot be approached for several months together, on account of the quantity of snow.

On that steep hill, uninhabited and surrounded on all sides with rocks, where no carriage can pass, the precipice is under a necessity of contributing to get in the crop.

The hay is put into long, but narrow nets; the bold mountaineer drags it to the edge of the rock, and rolls it down. He then cautiously descends after it, and carts his booty into his slender hut.

But let us now quit this dangerous district, and turn our eyes once more towards those rich meadows.

After the grass is cut, it is gathered into rows, and supposing it to be not yet sufficiently hayed, if there is time to do it, and it is likely to rain, they make it into cocks of various sizes. The rows would receive less damage from a hasty rain, and
the

the cocks from one that continues any time. If the grass is quite green, it may be left in the swarth.

When this work is done, the master returns home, telling his son, who accompanies him, what he is to do.

To-morrow, says he, you are to get into the loft the driest part of the hay, that which we cut to-day is not yet in proper order. On that side you are to put that which may be a little moist, for the hay we got in there to day is almost dried to powder. The heap will thereby acquire a brown hue, the cows will eat less of it, but they will give more milk.

Here, adds he, we will put the aftermath hay on the first crop, it will heat less, and make the hay taste better. Below we will put the coarsest of our hay, for this must be eat by our cows before it grows hard.

Above all things, continues he, my son take care not to put any iron amongst the hay, and still less amongst the rowen hay, as it might take fire and do much damage. You should not tread on the hay when it comes to a certain height.

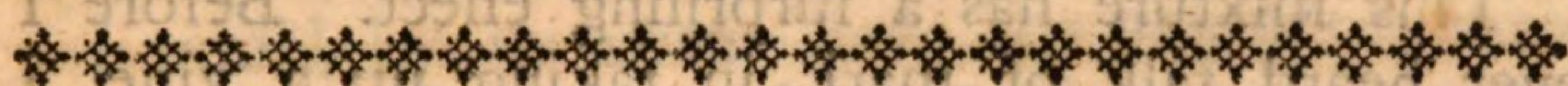
The young man listens with attention and pleasure to his father's instructions, and is preparing to ask him some farther questions, when his mother, who has been busied in household affairs, calls them to supper; the night reminds them that they have need of repose, the day, rather than their strength, being on the decline.

Happy couple! their consciences reproach them with no sin, they are thankful to him who gave and preserves to them healthy and robust bodies; sleep now closes their eyelids, and they speak only to wish each other a good repose.

Live happily! redouble your efforts, and be to-morrow, as you have been to-day, employed in the works that are suited to your station of life.

May

May the fruits of folly and corroding care be for ever kept at a distance from them ! May these happy children of nature enjoy continual ease ! Innocence and industry are the bulwarks of virtue, and the surest means of rendering a man happy.



ARTICLE XLV.

An Essay on the Culture of Vines, written by GABRIEL ANET, Vigneron (Vine-dresser) at Chailly in Switzerland.

THERE is no doubt but that the cultivation of lands, of what nature soever they may be, should vary according to the difference of climate, soil, and aspect.

The vines of the country of Vaux for instance, have been kept up time immemorial from cuttings, whilst those of our Bailiwick of Vevay cannot be long kept up by that means. We are under a necessity of taking them up when they are old, because the cuttings do not succeed.

I shall not attempt to find out the physical causes of this difference. The diligent planter should confine himself to labour, guided by experience.

My present design is to relate some discoveries I have, with this view, made, respecting the manner of cultivating vines in this part of the world.

Of the Mixture of Earths.

I shall, in the first place, treat of the mixture of earths. In taking up vines, the labourers always take care to remove the points of rocks, which may incommode them in their annual tillage of the plants, and in places where the soil is deep, they dig holes and bury the stones, which holes supply them with good

earth to cover the rocks where they are bare ; yet hitherto they have not known how to make the best advantage of certain veins of earth, which they find dispersed here and there in taking up the vines ; they know not what profit results from digging up this earth, and mixing it with that of the surface.

This mixture has a surprising effect. Before I ever heard talk of marl, in taking up a vine, I found a vein of very compact white earth, which seemed to be very soft to the touch. I made not the least doubt but that this earth, of which I had no experience, might to great advantage be mixed with that of the surface ; I tried it in several places where vines were growing, both young and old, and it gave to the old vines such vigour, that they seemed as it were to be grown young again, and bore plentifully, without the assistance of any other manure.

I can say the same of a kind of loose crumbly rock. in some places this runs pretty deep, but when it is exposed to the air it crumbles like lime or ashes. It does very well also when it is mixed with strong land, and if laid on in any quantity, it yields a wine of an excellent quality. Let us hope that the Vignerons will, for the future, be more attentive to a mixture of earth, as I am certain great advantages may be derived from it.

Method of taking up Vines.

As to what relates to the method of taking up Vines, it is pretty well known in our quarter of the world. Where there is a sufficiency of soil, the digging on this occasion cannot be too deep. This work should be done in autumn, and not in rainy weather, nothing is worse than omitting this precaution, particularly in strong lands.

My opinion is, that the spring following some barley, or other summer grain, should be sown ; but

in

in reaping it, at least half a foot of the stubble should be left behind on the land, and immediately after harvest the land should be again dug very deep, and the stubble be thereby covered. It enriches, swells, and pulverises the earth, which having been loosened by the winter frosts, the layers or rooted plants, that are put into it, succeed surprisingly well.

I would by no means have any one plant their layers when the corn is sown, as some recommend, it is the worst thing that can be done. They think to gain a year by it, but on the contrary it occasions a great loss of time. This truth is confirmed by repeated experience.

Of the Stock from which cuttings or layers are taken.

Every one knows, that it is of the greatest consequence to chuse good stocks to take cuttings from, as the quantity and quality of the grapes, borne by the young vine, will greatly depend on it.

The white sets are very improper to plant, we know very well that they bear amazing quantities of grapes, but it is as certain that these grapes do not yield a good or sound wine; for in the first place it retains the colour of the set, from which it is produced, and besides it has no sweetness; and still farther, tho' these grapes are more numerous, yet are they smaller than the others; so that taking all things into consideration, they do not yield more wine than the others, and what they do produce is of an inferior quality. For these reasons, every attentive and intelligent Vigneron will be cautious of taking cuttings from such stocks.

Some chuse the red wooded plants to take their cuttings from, but they also are in the wrong, the beauty and size of the shoot leads them astray. If they would but attend to the yield of the young plants produced from such cuttings, they would see that they bore grapes with large thick stalks; that this stalk grows crooked at the place from whence

the grape springs; that it springs horizontally from the shoot, sometimes even the stalk and the grapes point up perpendicularly: this is to be attributed to the smallness of the grapes, their being few in number and their want of weight.

Let a diligent survey be made at the vintage time, and the truth of what I advance will be very apparent. We may then conclude, that a red cutting is not proper to plant, if we would have a fine young vine.

How then are we to know a good stock from a bad one? It should be of a chefnut colour. It is neither very large like the red, nor very small like the white; it holds the middle space, both in point of size and colour. This is certainly the best stock to have a good vine from; but I would, by all means, recommend that when they are getting cuttings, it should be from old vines, or at least those of a middling age, but never from young ones.

If by any accident, sets have been planted from a bad stock, it will soon be perceived, in this case, the best way is, without delay, to root up those plants that do not promise well, and put in rooted plants in their stead.

Before I proceed to another article, permit me in this place to make one remark.

How comes it to pass, that in this part of the country we see so many seemingly fine vineyards, regularly planted, supplied with vigorous fine vines, in appearance, which yet yield very little wine in comparison to what does another neighbouring vineyard, which is yet destitute of all these seeming qualities? This question, say they, may be easily answered; it is because one is from a better stock than the other. I acknowledge it; but why are any of our vineyards planted from bad stocks? In my humble opinion, it proceeds,

I. From

1. From people's not giving themselves the trouble of enquiring of their experienced neighbours, which are the best stocks to take cuttings from; every one acts in this matter according to his own idea, though he knows nothing of the matter.

2. People will not, I mean in general, take these cuttings themselves. What is the result?

3. They trust to others, who either have not knowledge in a matter of such importance, or who, if they have knowledge, do not take the trouble of chusing properly; and wherefore? Because being paid only at the rate of five or six-pence a hundred, they cannot get enough in a day, to pay them for their time; it is impossible they should do so, at least if they chuse only what are good.

4. Besides, this work is sometimes trusted, nay very often, to persons of no integrity, who, not content with cheating those who employ them, by taking all that come under their destructive knife, and falling without mercy on the youngest plants, and thereby disfiguring them; this is not all I say, for with grief I must declare the truth, the government permits an open trade to be carried on in cuttings of vines, and to whom is this permitted? To people who are not possessed, as proprietors, of an inch of land, and of course must be thieves who deserve punishment.

However, thanks be to God, this evil is not general. In several districts, people are prohibited from making cuttings in any body's ground but their own. It is to be hoped, this good example will be followed elsewhere, and that regularity and order, will take place of licentiousness and vice.

Having pointed out the sources of these evils, it will be no difficult matter to adapt proper remedies. I shall say a word or two on the subject.

We should, as much as possible, make ourselves acquainted with the quality that a good vine stock should

should be possessed of, and for this purpose consult men who have had long experience in the matter. When this is done, we should ourselves collect, if possible, all the cuttings we may have occasion for, without trusting to others, who will neither have the same care, nor indeed can they have the same motives for care as we have.

But as it is not possible we should collect them all ourselves, either for want of leisure, or sufficient knowledge in the matter, we must be sometimes obliged to trust this affair to others.

When this is the case, 1. Let us trust this work to men who having long worked in vineyards, may be presumed to know how to make a proper choice.

2. Let them be men of known probity. Be sure to distrust those who may say they gathered so many cuttings in such a time. Those who take the most time, and gather least in number, are the men you can most depend on.

The Season for planting Vines.

As to what relates to the season for planting vines, it appears to me, it may be done with the greatest assurance of success betwixt Martinmas and Christmas. With regard to the season, it is the same thing whether cuttings or rooted plants be made use of, and that for the following reasons.

1. People have more leisure in autumn than in the spring.

2. The cuttings planted in autumn, are in no danger of being overtaken and spoiled by droughts, which is frequently the case with those planted in the spring.

The Method of planting Vines.

As to the method of planting vines, what is principally to be taken care of, is the distance that is to be preserved from plant to plant, for with regard

gard to the depth, it must be regulated by the depth of the soil.

I am firmly persuaded that in planting a vineyard, the plants should be placed at least three feet distance one from the other, particularly if the ground lays on a flat. My reasons are as follow:

1. The young vines grow thereby much larger and finer; and in cutting the vine, it may be made to spread or grow high, as the Vigneron pleases.

2. There is no danger of their branches being stunted, and growing bushy, which is an ugly sight when they are full leaved.

3. The branches of the vines are less in danger of being injured, and look handsomer: It is only necessary to behold those vineyards, where the plants stand so close as almost to touch each other, so that you cannot pass through the rows without rubbing against them, when the young shoots are made, and as they are very tender, of course breaking them; this occasions a very considerable loss, for when these shoots are broken off, they are entirely lost, and of course the fruit they would in all probability have borne.

4. If you place your plants at a smaller distance than that I have above-mentioned, you will find that the culture of the vineyard will be much more difficult and troublesome; in digging between the rows, the workmen tear their cloaths, scratch their arms, and in fact, work in continual torture; whereas at the distance I have recommended, which I constantly observe, and with the greatest success, all this trouble and loss is avoided.

5. It is very evident that the produce will be much more considerable, and particularly the wine will be without comparison better; for every day's experience confirms it to us, that in vineyards where the plants stand too close together, the grapes almost always rot before they attain a perfect maturity.

What

What is to be done in this extremity? the grapes must be gathered, and what are they? either grapes not half ripe on account of the shade the plants mutual cast, or rotten from the same cause. And what sort of wine is produced from these grapes? It is heavy, raw, and very improper for keeping; whereas in vineyards, where the plants stand at the distance I have already recommended, the grapes attain a perfect maturity, grow much larger, and are never rotten before they are ripe; and the sun darting on them all his genial beams, they produce an excellent wine.

Rooted Plants to be preferred to cuttings.

Which are to be preferred, rooted plants or cuttings? To this question I shall, in a few words, give an answer, which I submit to the judgment of the intelligent.

In my opinion, rooted plants are much to be preferred to cuttings, particularly on strong land. The most promising plants are easier distinguished, they always take better and bear sooner.

When a vineyard is to be planted, it would be too much to expect to have a sufficiency of rooted plants made with little baskets in the vines, or in the manner hereafter described. Every one knows the method of making rooted plants.

You are to plant cuttings at half a foot distance from each other, in good land well prepared for that purpose; they must be kept clean, and when at the end of two years they are taken up, great care must be taken that they are not damaged; and if any of them are defective, they are to be thrown away.

But if you would have your vineyard soon in full bearing, and would also have rooted plants to supply the place of the young plants that may have failed, or even the old ones, the following is the method I have of procuring them.

Method

Method of procuring rooted Plants.

I cause some turf to be taken from a meadow in pieces a foot square, and about two or three inches thick, which I lay down by the side of a plant, come from a good stock. At the depth of half a foot, I lay on this turf, turned upside down, a shoot of the vine, which I cover with three inches of mould, leaving two buds of the shoot out of the ground, and cutting off with a knife all the buds from the ground to the plant it sprung from.

If I am inclined to preserve the branch of the plant, the shoot of which I lay down, I leave on it the first bud; and if the shoot pushes forth any unexpected branches, I take care in the spring to cut off all between the plant and the earth.

The following year I cut off the shoot that was laid down near the earth, and afterwards cut it close to the mother plant; if I left one bud, I also cut off the shoot it has made near the branch.

When this is done, I disengage the turf on which is the rooted plant, and take all up together with a spade, carrying it to the place I had prepared for it to supply a vacancy, either in an old vineyard, or in one lately planted, taking care to dig a deep hole, and to put under the turf a foot of earth, a bushel of new mould, either of turf rotted for this purpose, or of earth taken from the drain of a meadow, which has been mixed with dung to meliorate it. In a short space of time the empty spaces are furnished with good plants. This method of procuring rooted plants is in my opinion preferable to the use of baskets for this purpose, there is, however, no great difference.

These rooted plants are of great use for supplying the vacancies in old vineyards; and I cannot, without concern, see the Vignerons, when some plants have failed in a newly made vineyard, wait for supplying their places till the vineyard is in a condition

of supplying layers. Experience teaches us, that nothing hurts the vineyards in this part of the world more than taking many layers from them, they being either taken with too little attention, or else our soil is not adapted to produce them.

Method of manuring Vineyards.

I cannot in this place forbear mentioning a method I practise of manuring my vineyards; it is somewhat singular, and I do not propose it as a method that can be every where practised.

I pare off the turf of a meadow in summer time, that is to say, after the grass is mown, and the hay got in, to the depth of about two inches. I lay this in a heap, till the grass is rotted, which happens about autumn: I then have the heap stirred and turned, and leave it to be pulverized during the winter.

In the following spring I have this heap carried on to a piece of old or new vineyard, which ever most wants manure: I then spread it, taking care that it covers no more ground then it did in the meadow: I believe this method to be greatly superior to laying on common dung, and repeated experience gives me reason to believe so.

An old vineyard manured in this manner, whose shoots have been small and half dry, so that nothing could be expected from them, has been so much improved, and the following year the change has been so great, that the plants could scarcely be known for the same. Besides, I have remarked, that the crops of vineyards, thus manured with rotted turf, have been much larger. And as for the quality, every body knows that the wine produced by a vineyard that has been dressed with dung, is generally heavy, raw, insipid, and not proper to keep, and it is also subject to be ropy: whereas that produced by vineyards, that have been
manured

manured with rotted turf, is fine, brisk, strong, sweet and sparkling.

But say they, you build with one hand and destroy with the other; what must we destroy our meadows? surely this is absurd.

So far from destroying the meadow, I considerably improve it. In the first place it is evident I destroy all the weeds, and that in an effectual manner; for immediately after the turf is pared off, I plow the meadow to the depth of six inches, and leave it in this state during the winter. In the spring I take as much dung as I should have laid on the vineyard, with this I manure my meadow, and sow on it afterwards hay seeds, which I cover with a spade about an inch and a half; I do this part of the work very leisurely, that I may spread the seed as regularly as possible. When this is done, I sow some Dutch clover, and taking a rake level the mould, at the same time covering the clover seed. By this management I get two good crops of hay in a year, whereas had I left the turf on, I should have had but one.

Of the Culture or Tillage which Vines require.

It is now necessary I should say something of the tillage which vineyards require, and in this matter I differ in judgment from other Vignerons.

It is astonishing to me, that in the great length of time in which we have cultivated vines, that no one should have discovered that the best stirring that can be given them, is, if I am not greatly mistaken, in autumn; from the vintage season, till Christmas; and at this time labourers are to be procured at a reasonable rate.

They greatly err, who imagine that by this stirring the cold is let into the earth, and that the vines are thereby exposed to the frost. A long experience has convinced me, that this stirring, far from ex-

posing them to the frost, preserves them from it, particularly if they are at that season manured.

The frost has sometimes come on immediately after I had done digging, yet I never found that it in the least damaged my plants, on the contrary, fewer of them were frozen than in other vineyards which had not been tilled in autumn. But the advantages to be reaped from this practice are considerable.

1. Can any thing be better adapted for destroying all kinds of weeds?

2. The dung which is then laid on the land, warms it in the winter, mixes with the earth, nourishes and strengthens the roots of the plants, and makes them fruitful; every part of it tends to profit; whereas that which is laid on in spring, is frequently a great part of it lost, by being carried beforehand in small parcels into the vineyard; here it dries and evaporates, before it is buried in the ground; this was the case in 1761 and 1762, when the north wind blew the whole spring, and the ground could be but very slowly dug, on account of its being so hard. To this we may add, that when the second digging comes soon after the first, the dung is again brought to the surface and loses all its substance.

3. The ground being thus loosened in autumn, imbibes more easily, and in greater abundance, the salts which the air, the snow, and the rain, communicate to it during the winter, it is a sponge which loses nothing, and this is undoubtedly of as much service to it as dung.

4. The spring digging becomes thereby much easier to be executed, strong lands become loose and manageable, so that one man can do the work of two, an advantage so much more to be considered, as labourers are then at high wages, as we have lately experienced, when many Vignerons, notwithstanding

ing the fineness of the weather, were surprized by the leaf before they had broke up all their vineyards.

5. The next advantage resulting from this practice, is of more worth than all the rest. Is it not evident, that a vineyard being clear from weeds in the spring, will not be impoverished by feeding such a number of noxious plants, which exhaust it to the great detriment of the vines which have only the slender remains? For every one knows, that most vineyards when they are dug, are like grass fields, and that frequently they are obliged to pull up the grass before the spade, some of which having already seeded, the seeds sprout a-fresh, and give a new crop; besides, towards the end of August, and in September, they are obliged again to go over the vineyards, at the time the fruit is ripening, to pull up the grass, lest it should contribute to rot the grapes before they are arrived at a due maturity. In pulling up the grass at this time, they cannot but greatly damage the grapes, which are then very tender.

6. Finally, if there comes a frost in spring, when the vines have put forth their buds, this autumnal stirring will prevent the white frost from taking hold of the plants, which will also be helped by the heat that exhales from the loosened soil. This single benefit, will repay the Vigneron all the expences he may be at on this account, for several years.

Many Vignerons laugh at me, when they see me doing this work. What, say they, must we dig our vineyards immediately after the vintage, let the cold into the ground, bring on expences out of time, and before we have sold our wine? What folly is this?

Others, however, whether influenced by example or reason I know not, have adopted this method, and I am well persuaded they will never drop it again.

The

[The original Editors in this place make the following remark. If the slope of the vineyard is any thing considerable, may we not apprehend that the loosened earth will be carried away by the rains, which fall plentifully the latter end of autumn. If the vineyards are less on a slope, or nearly on a flat, and if the waters of that wet and rainy season, when the evaporation is less, should fully penetrate the loosened and spongy earth, is there not reason to apprehend that the December frosts, falling on this moistened soil, will kill the plants? Should the vines be cut when this autumnal stirring is given, as was tried near the lake of Biene at Douane? We could wish the writer of this essay would make new experiments in order the better to resolve these difficulties.]

It would, however, be just, that the proprietors, in order the more to excite the courage of the Vignerons, should assist them in supporting a part of the expences of this culture, at least, till the Vignerons should by experience be convinced, how very advantageous this autumnal stirring would be to them; and I would advise all who may attend to my counsel to dig deep in autumn, thereby providing against what will undoubtedly happen in the spring, when the labourers will baulk the work, on account of the grounds digging easily: I would also advise them to give, nevertheless, to their vineyards, the three usual stirrings at the proper seasons.

Let them esteem it the most essential part of their culture to keep their lands clear from weeds, which impoverish it greatly, and that at the expence of the vine plants, so that they cannot be too effectually destroyed. Finally, the frequent stirring of the ground makes it work better, saves dung, and is, with the blessing of God, the principal source of plentiful crops.

An Obstacle to the due Culture of Vineyards.

I shall not in this place pass over an obstacle I discover to the due culture of vineyards. It arises from too many acres being trusted to the care of one single Vigneron. I have observed that Vignerons, who had under their care seven or eight acres of Vineyard, have not made more wine than those who had only four acres. Whence can proceed this astonishing difference? It is not very difficult to account for it. In my apprehension what follows is, at least, in a great measure the cause to be assigned.

A Vigneron, who has too much ground on his hands, cannot bestow on his vines the quantity of tillage they require. He can only dig them once a year, and that but slightly; he only, as it were, scratches the ground, and how should he find his account in it? Yet must he feed his workmen.

Shall we say that he should employ labourers enough to dig his vineyard, at least twice a year, and that regularly. But, besides that workmen are not always to be had, this calculation will be found erroneous; for experience every day convinces us, that the more numerous the workmen are on a vineyard, the more they eat, and the less work they do. I have seen a band, consisting of eight or nine, and another of only four; and I have observed, with great astonishment, that the last had done more work at the days end than the others; the reason is, that in these numerous bands, where you have one good diligent workman, you will find several who chatter away half their time, and whilst they are talking, they must be upright; for they will tell you, they cannot do two sorts of work at the same time: and whilst they are standing upright, the work stands still, yet they have not a whit less appetite at meal time: thus is the poor Vigneron infallibly ruined. He has too many mouths to feed, and too few hands at work.

If

If I am asked what quantity of vineyard should be given to one Vigneron, I shall not dissemble my opinion; I think that a sensible proprietor will not let, at most, above four or five acres of vineyard to one Vigneron. It is better to have several, and will be more advantageous both to the landlord and tenant; as to the number of workmen, I think it best never to have more than three or four together, the reason for it is, their attention will be less drawn off, and of course they will apply with more diligence to their work. I do not, however, pretend, that my advice should have the force of a law; let every one do what he thinks best, but I can say with the greatest degree of truth, that I constantly follow this practice, and that I thereby reap very considerable advantages.

The reader will observe, that I only skim the surface of the subject; to say all that could be said respecting the culture of Vineyards would fill a large volume. But this is not my present design. A great deal might be said on the method, season, and persons proper to thin the leaves of vines.

 ARTICLE XLVI.

An Essay on the Culture of the African Millet, Sorghum, milium nigrum. Written by Mr. TSCHIFFELI.

THIS Millet is a plant which merits the husbandman's utmost attention, and that for the following reasons :

1. It thrives in all sorts of soils.
2. It neither requires much dung, nor a great deal of tillage.
3. It is not subject to the depredations of birds, which are very fond of panick and common millet.
4. It yields very large returns.
5. Lastly, it does not exhaust the land in proportion to the largeness of the crops.

The seed of this sort of millet comes originally from Africa, where it supplies the inhabitants with food, as with us here, wheat, and other grain. But they are mistaken who thence conclude, that it will thrive only in hot countries.

Providence has endowed it with such excellent qualities, that it may, with success, be cultivated in countries much colder than Switzerland.

The first seed of it I received was from Mr. Engel, magistrate of Echalens, whose attention in promoting the improvement of Agriculture is well known. He had procured it from Pomerania, it being sent to him by the celebrated Doctor Schreber, in the spring of the year 1760. I had from him about a spoonful.

In the month of May of the same year, I sowed it on a gravelly soil, hard and stony, very much exposed to the north wind, and which the year before had borne some very indifferent bere.

In the month of February preceding, some human ordure had been laid on this land; and in May, the clods were all broken before the seed was spread.

Having so small a quantity of seed, I took care to spread it very thin, and to this do I ascribe the stalks running to the height of eight feet and more. The ears were above ten inches long, and I am persuaded, that if a shower of hail had not fallen on it, the spoonful would have produced me at least a peck.

I reckon this accident occasioned the loss of half my seed; I had, however, enough left to divide with my friends in Switzerland, as well as elsewhere.

In the month of May 1761, I sowed about a quart of seed, or near a pound, on some land, from which I had first pared off the turf, and afterwards burnt it. The space on which I sowed the seed was about twenty paces long, and ten broad.

Sometime before harvest I perceived I should have allotted three times as much ground for that quantity of seed. The stalks, which were very close, were interwoven one with the other like the hairs of a brush. They were scarcely five feet in height, and the ears also were much shorter than the preceding year; this, however, did not prevent my reaping about seven pecks, or above fifty for one. This year, 1762, I sowed about four pounds of seed, or about half a peck, on some pretty good land, being in quantity about thirty square rods or perches.

Last year the same land bore potatoes, and as I had laid on no fresh manure for the millet, and had neglected to plow it before the winter, for it was only turned over with a spade before sowing, I imagined I had not sown the seed too thick: but in this I was greatly mistaken.

The millet came up almost as thick as the year before, and I had not the courage to thin it, which would have been right, the stalks and ears were shorter than the first year.

Notwith-

Notwithstanding this, by the goodness of providence, I was enabled to reap twenty bushels, being 640 pounds, of course a return of 160 for one.

There can then be no reason to doubt, but that moderate land, sown thin, and properly prepared, will produce, one year with another, 100 bushels of millet per acre. For I got as much in proportion, tho' my land was but slightly tilled, and I manifestly sowed my seed too thick. This is certainly a most wonderfully encrease, in what light soever we behold it.

What grain have we, which in our fields will yield a return of 150 for one, and which, at the same time, will sell so well, for in price it is on a footing with wheat? It is true, it yields a heavy, crumbly and indifferent bread, but if it is made into pottage, it is excellent, very nourishing, and of exquisite flavour. Not only my servants and workmen are very fond of millet thus prepared, but I myself prefer it to the best rice, which will not grow in this country, and comes at a much higher price.

The millers, whose reputation is not of the best, return you a good third of a bushel of millet meal for every bushel you send them, after deducting toll, bran, waste, &c. Now I know by experience, that this quantity, when it is made into pottage with milk, will serve at least fifty men for a meal. Surely they cannot be fed at a cheaper rate.

In times of scarcity millet must be of great use, as with the addition of potatoes the poor might live comfortably.

I will with great pleasure supply those with seed who cannot conveniently afford to buy it.

An acre of land requires, at most, but ten pounds of seed, and I can, from my own experience, venture to assert, that millet does not impoverish land in proportion to its produce. The land I sowed in 1760 and 1761 yielded the following year fine plants of Dutch clover, and rey grass in as great plenty, with respect to the crops, as the neighbouring land.



ARTICLE XLVII.

An Example of the Partition of a Common in Switzerland, written by M. DE WERTH, LORD OF TOFFEN, Member of the Supreme Council at Berne, and chief Magistrate of Vevay.

THE disadvantages attending commons, are pretty well known, but a remedy may easily be applied.

As every place has its particular customs, no general rule can be framed, but on my estate, I managed in the following manner.

The peasants, or labouring people, who had no land of their own, had long requested that a partition should be made, or at least, that every one might have an acre or two of land. They always, however, failed of success.

It is to be observed, that on the one hand I lost many families who left a place where they had no possession, and on the other hand, the request of these people was very reasonable.

I told them to draw up a petition to me, and sign it. This was done, and signed by the greatest part of them. They concluded, with requesting that each master of a family should have two acres of land.

I assembled together the inhabitants of the place, and told them that their relations and neighbours requested, that they might each have a small portion of the common allowed them, and I asked them whether they would pay any attention to this request,

quest, and submit the decision to the plurality of voices.

The richest of them opposed it, and having collected the votes, two thirds were for the partition, but the remaining third part absolutely refused it.

I told those who were for the partition, that if they thought they had a right, their only way was to petition properly for it. They then addressed themselves to me as their judge. Three fourths were now for the partition, but the other fourth opposed it.

After having heard their reasons, and read several papers on the subject, I pronounced sentence, in which, after mentioning the general reasons for such a partition, I laid it down as a principle, that the property of the common was vested in me, as being the Lord, and the use of it belonged to the townsmen; that when the Lord and the majority of the townsmen, agreed for their greater convenience, to enjoy the use of the common in any particular manner, this should of course be submitted to; for these reasons, I allotted to each father of a family, one acre and an half, instead of two, which they requested, so that above half the common was still left for general use, and in this the rich had greatly the advantage.

This piece of land for each, was only to be for life, without the power of alienating, mortgaging, or changing it in any shape whatever. The number of these portions was always to be the same, so that if there should hereafter prove to be fewer fathers of families, than portions, the surplus was to be let for the benefit of the poor; when there are more fathers of families than portions, some are to wait till the portions become vacant.

I will not conceal the reason I had for making this regulation, it was founded on the repugnance which I knew they had to admitting any body free of their town-

township; if by the extinction of the heads of any families, the vacant portions were to have been annexed to the common, they would with this view have never admitted any body free of their township. They would have been still less inclined to admit any, if a portion of land from the common was to have been immediately assigned to the new comers.

With regard to the revenues of the poor, which must of course be diminished by the vacant portions being occupied, this may be made up by the fines on admittance to a freedom, which fines should be applied to their use.

The unhappy disposition of most of our cities, towns, and villages, of not receiving new freemen, is one cause of depopulation, and one of their secret motives is, that they may keep to themselves the enjoyment of the commons.

It appears to me, as if the greater part of our commonalties and corporations were so many Tontines, where the survivors hope to be benefited by those who die, so that if we once adopt this system of dividing commons, the principal obstacle to the reception of new freemen, will in many places be removed.

The more wealthy peasants appealed from my sentence, which was pronounced in September 1761, but as they did not prosecute their appeal within the limited time, it was of course dropped.

In April 1762, I proceeded to execution; I caused as many portions of an acre and a half to be set apart, as there were families. I assembled all the commonalty on the spot, and desired that such as were willing to have portions, should declare themselves. Four parts out of five, then declared for a division. The others protested; I caused all those who were willing, to draw lots, and every one had his lot, according to the number that referred to it

I felt

I felt, at that instant, a very sincere joy, to behold the transports of these poor people, and to hear the blessings and thanks which they heaped on me.

As for the others, though I set apart their portions, they carried their clamours to the states; who, as usual, referred the matter to the consideration of a committee, where the opponents did all that art or cunning could suggest to frustrate my scheme.

They began by disputing with me the property of the common. I produced my title deeds to the Lords of the œconomical council, who, by the unanimous and favourable report they made to the senate, obtained for me an absolute confirmation of my rights, in consequence of what was contained in my title, and the possession which had never been disputed with me.

After this the thing was so plain, that the only question was whether my sentence should remain in force or not; but the opponents demanded a view, upon which the Lords of the committee took the trouble to go to the place, and having found every thing as my sentence expressed it to be, they had the goodness, in order to put a final and summary end to the affair, to offer their mediation, and an absolute arbitration.

All parties accepted of this offer with joy and thankfulness: my sentence was taken for the basis, and confirmed in all points, except that instead of an acre and an half, they allotted only one acre to each family.

In other respects my rights were unimpeached, and in particular this principle was firmly established; that in future, if the Lord, as proprietor, and the greatest part of the freemen, are of one mind, it is to serve as a rule with respect to the partition of commons.

This sentence was afterwards ratified by their excellencies the senate.

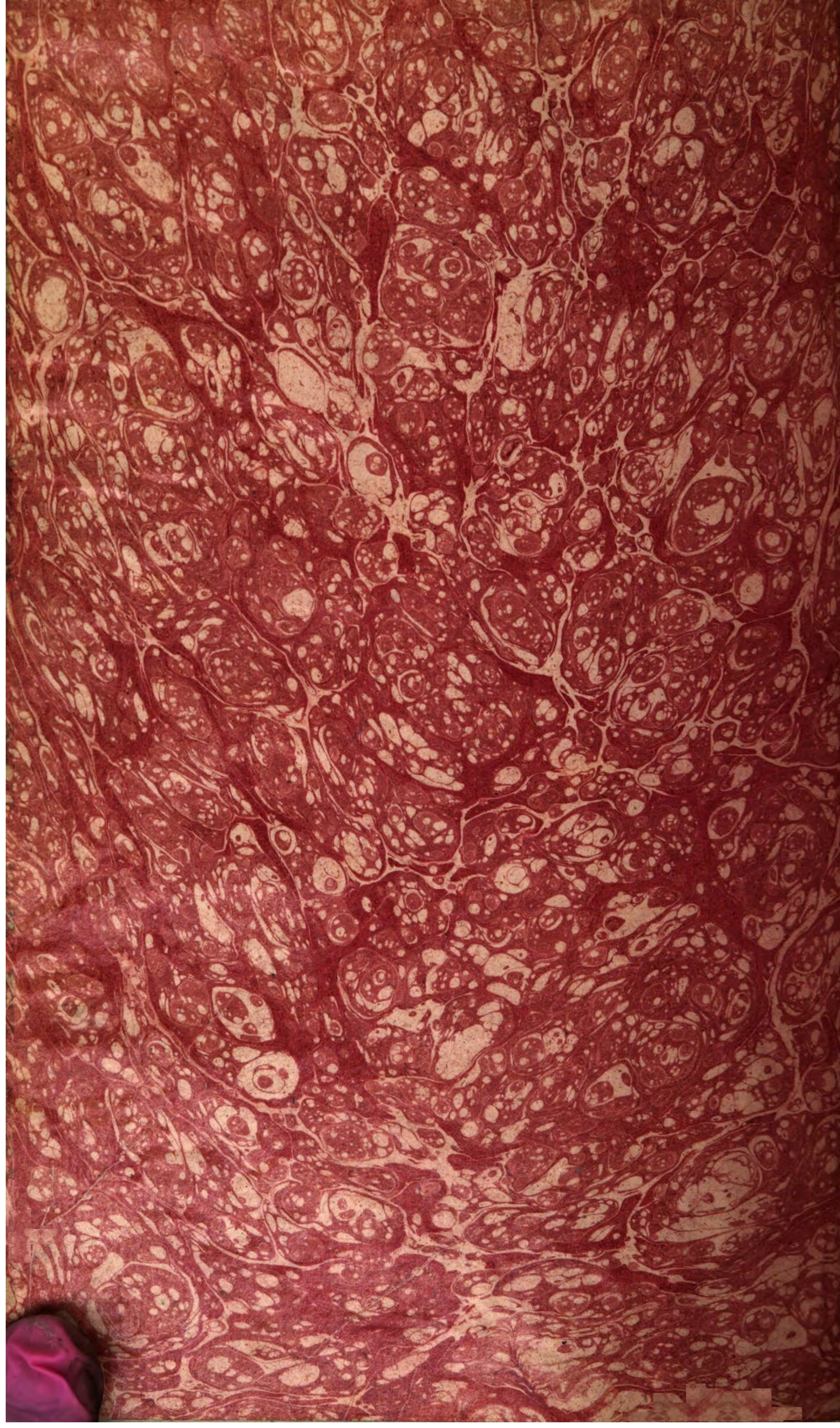
This

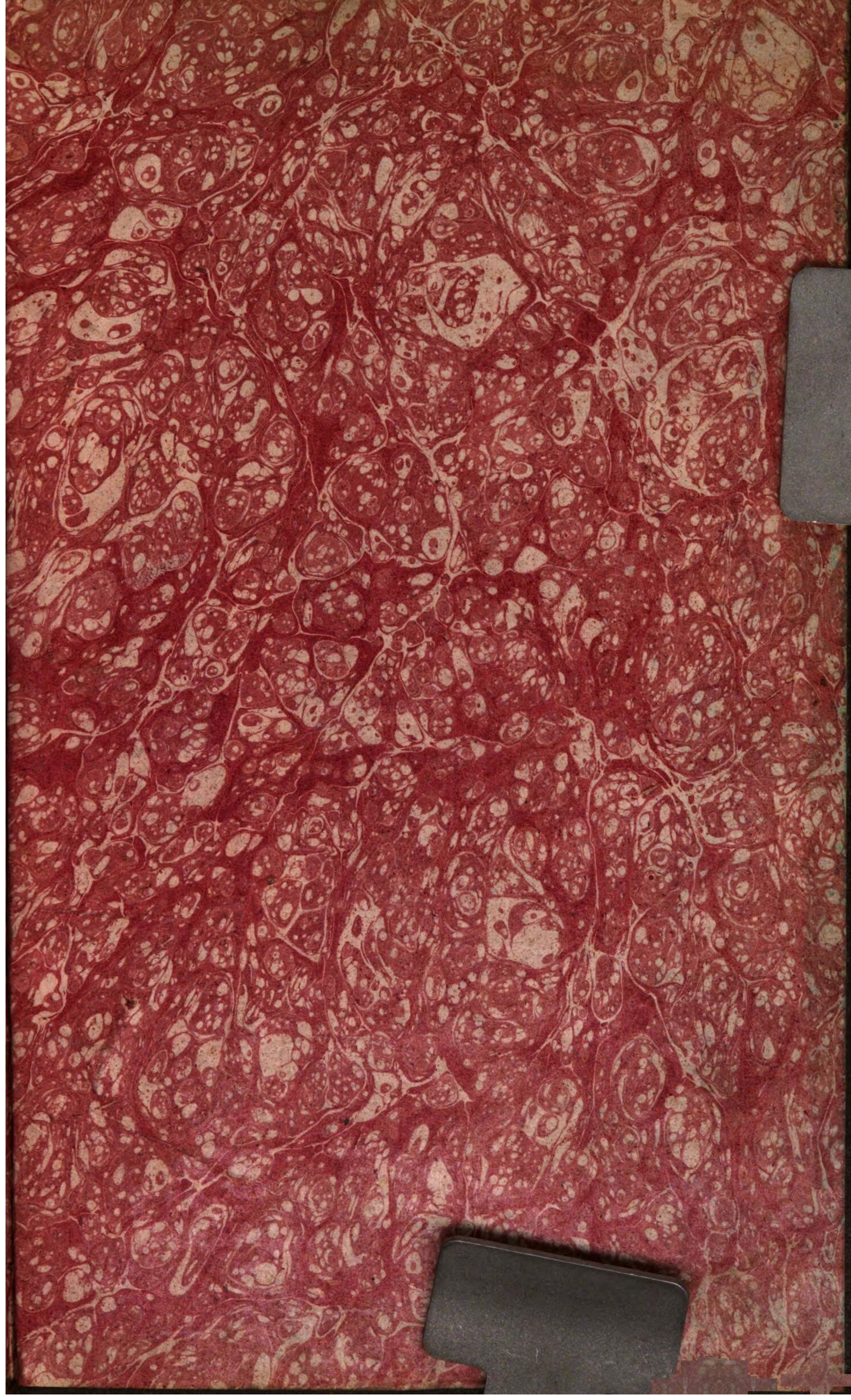
This affair was in suspense till the month of June, and there being an order issued, that the land should not, in the mean time, be either plowed, or otherwise cultivated, it is not to be supposed it could be much mended. Notwithstanding this, they had a load of hay from each acre, including the first and second crops, and they told me, they hoped next year to have a load and a half. Now as two loads will winter a cow, either by buying half a load more, or getting a piece of land that will yield it, they may keep one, with this view I offered to advance them money for the purpose. All the summer the cow may go on the common. This cow may supply the whole family with food, and with what they can besides earn, they may live tollerably well.

The family being in this manner attached to the spot, will neither emigrate nor sink into poverty, and this is what I principally aimed at.

From this example, which I have the honour of laying before this illustrious society, it is evident that by proceeding from smaller matters to those of greater moment, all the commons may be so divided, by which means population will encrease, agriculture will be more flourishing, and this cannot but add to the riches and happiness of our country.

F I N I S.





Foreign essays on agriculture and arts consisting chiefly of the most curious discoveries made in the several provinces of France, Germany, Flanders, Switzerland, etc. and communicated by the learned in those countries for the improvement of British husbandry

London 1766

Oecon. 577

urn:nbn:de:bvb:12-bsb10295095-7